Technical Information
Document

First Nations and Aboriginal Communities Project Management Manual

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Foreword

This document is intended to assist First Nation project managers who are responsible for implementing capital construction projects in their communities. Procedures and principles discussed are intended to provide a management framework to use throughout a capital construction project.

Scope

This document describes the concepts behind Project Management, including why its use is recommended. Information and suggestions on how a project should be managed are discussed through the following phases of capital construction project implementation:

- Initiation
- Planning
- Design
- Construction
- Take Over and In-service.

Responsibilities

While this document suggests that certain people or positions (e.g. the Band manager or the project manager) perform specific functions, it is appreciated that different individuals or communities organize in different ways. The position and title of a person or persons recommended to carry out a particular task should therefore be interpreted with flexibility. As well, individual communities may belong to Tribal Councils or other technical organizations that provide various technical or project management functions that will dictate the style of project management.

Glossary

Accommodation Scales:	"Accommodation Scales" is a term which refers to departmental standards of size, quality or quantity. They are used for such things as roads and schools (e.g. a school with so many pupils in certain grades needs so many classrooms of a predetermined size etc.). The term "levels of service standards" is sometimes used instead of "accommodation scales".
Administrative/Financial Support:	Administrative/financial support includes accounting, clerical, and administrative services needed to implement a project. Such tasks as payroll preparation, invoice payment, financial statement preparation, typing, telephone answering, material control, personnel record upkeep and file control are generally included. The person(s) responsible for administration/financial support will report to the project manager. Note: In some cases, the band manager supplies the project manager with administration/financial support services.
Band Chief and Council:	The Band Chief and Council are the project manager's authority insofar as projects referred to in this manual are concerned. These persons should be interested in the broad and fundamental issues (e.g. what must be done, when it is needed, how it will be paid for) affecting the project.
Band Manager:	The Band Manager's role in project management is usually one of providing the project manager with advice and support on such things as community hiring policy, contracting, purchasing and administrative practices. Note: In some instances and particularly on smaller projects, the band manager may play a larger role in representing the Chief and Council and supervising the project manager.
Bill of Materials:	This is a prepared detailed description of all the materials to be used in a project. The description will include all information needed to identify and purchase (e.g. quantity, dimensions, specification number, colour, etc.) the material.

Building Committee:	The Building Committee is a "subcommittee" or "portfolio" which is set up under or appointed by the Band Chief and Council. The committee acts on behalf of the Chief and Council in all but the most important matters concerning the project. The member or members must take the time to become familiar with all the issues involved in the project. The committee should also ensure input is received from the community and user groups.
Capital Construction:	Capital construction means the construction of buildings (e.g. schools, band offices, fire halls) and infrastructure (e.g. roads, water treatment plants and distribution lines, sewage collection and treatment plants, power distribution lines).
Community Maintenance Superintendent:	This is a person, hired by the community, whose duty it is to ensure the communities buildings and infrastructure (e.g. roads, water distribution systems, sewage treatment facilities, electrical distribution system, band buildings, etc.) are properly maintained and operated. The community maintenance superintendent may do most of the work personally, which would be the case with a small community. For a bigger community, the maintenance superintendent could direct a large staff and be responsible for a large budget.
Construction Manager:	The Construction Manager is the supervisor who is responsible to the project manager for day to day activities on the construction site. A construction manager is normally employed when day labour, rather than contract, is used to carry out the construction. Note: For smaller projects it is not unusual to have the same person fill both the project and construction manager roles.
Consultant:	Consultants are private firms which are in the business of providing professional services (e.g. design, project management, construction inspection, advice). Consulting firms employ professionals (e.g. engineers/architects) and support staff who have the training and expertise to perform this work. Engineers and architects are controlled and licensed by provincial professional associations who are chartered by provincial legislation to perform this control function.

Contractors:	Contractors are firms hired to carry out all or a portion of the construction work on a project. These firms work on the basis of an agreement (e.g. a contract) which specifically details what the contractor will do in return for an agreed upon amount of money.
Design:	The design is a term which refers to all those documents which direct how the construction work will be done. The design usually consists of a set of drawings and specifications; however, it can include other things such as bills of material, a day labour plan, or schedule. A design is usually prepared by a consultant, and it carries the professional seal or stamp of the engineer or architect.
Drawings:	The drawings give the size, location and arrangement of all the materials that go into the construction. The drawings show precisely how the materials are put together and the work is done. Drawings are often referred to as blueprints.
Latent Defect:	A defect in construction which is not evident at the time the final certificate of completion is signed, but which appears in the constructed building or infrastructure before the end of the warranty period.
Lead Time:	Lead time is the amount of time (e.g. days, weeks, months) which must be provided ahead of the date that a facility is required in order to ensure that all the activities required to complete the facility can be accomplished.
Project Manager:	The Project Manager is the suitably qualified person or firm hired by the building committee or chief and council to manage the project and have the primary responsibility for its successful completion. The size and complexity of the project will dictate the qualifications and experience needed by the project manager.
Project Team:	The Project Team is a team of the key management persons who can deal with specific situations, provide expertise, and in general achieve the project's objectives.
Specifications:	The specifications describe the quality of materials. They also describe the methods and standards of work required to complete the project. Drawings and specifications are prepared as complementing documents by the same consultant.

Suppliers:	Suppliers provide the materials and/or equipment needed to carry out the project. Suppliers include such organizations as local building suppliers, manufacturers, ready mix companies, saw mills and equipment rental firms.
Trades Supervisors:	Supervisors are responsible for specific tasks (e.g. structural, electrical, masonry, plumbing etc.) carried out on the construction site. Supervisors must have the qualifications (e.g. training, licence, experience) required to carry out or supervise the work for which they are responsible. Supervisors report to the construction manager.

Part 1: Project Management Theory

1.1 The Project Manager's Role

Project management is based on the idea that once the requirement for a capital project is identified and a budget is allocated, the job of bringing the necessary building or infrastructure into existence is the responsibility of one person (Note: This person could be a firm). That person is the project manager. The reason for hiring a project manager is to get the job done properly (i.e. achieve the project's time, cost, and quality objectives). Therefore, the single most important thing that a chief and council does in implementing a project is to hire the right project manager.

Section 2.8 will discuss the qualifications of the project manager in more detail.

1.2 Objectives

Put in simple terms, project management involves establishing objectives at the start of a project and then taking the necessary actions to ensure that these objectives are achieved.

Objectives for a project must be something that can be measured and that everybody understands. Project management uses three. These are time, cost, and quality:

1. Time is normally expressed as a date or dates by which the complete project or parts of the project must be started, partly completed, or fully completed.

2. Cost is a measure of the dollar value of parts of or of the entire project. Various terms such as budget, cash flow, estimates, or bid are used when referring to cost.

3. Quality expresses the physical requirement of the various components of the project. It includes such things as the requirement of scope and size, the kind of materials to be used, the construction techniques to be employed and the concept of good workmanship. The quality is normally set out in the specifications and drawings which are based on all the applicable codes, standards and regulatory requirements. In addition to having the specifications and drawings well prepared by qualified persons, common ways to exercise quality control include such things as inspection and sampling.

Time, cost and quality are measurable individually. However, they are closely related to each other

and an increase or decrease in one normally means a change in at least one of the other two (e.g. if time increases so does the cost, if quality is increased the time and cost may also increase). This can be explained in terms of some common examples. When a project takes more material or some work is added, the cost will increase and so will the time needed to complete the job. Alternatively, if the project is reduced in quality, the cost and time needed to complete the work will be reduced. If things like bad weather, low productivity, or unavailable material increase the time required, then the costs can be expected to increase.

1.3 Project

To discuss projects and project management, it is necessary to define a project. Many definitions are used but in this manual a project will be considered to be the commencement and completion of an undertaking which has a beginning and an end.

The key words in this definition are "undertaking", "completion", "beginning" and "end". A brief description of these terms are given below.

An undertaking, insofar as this manual is concerned, means a capital construction project.

A beginning or end means actual calendar dates to start or complete the project. When a project is to be finalized on a certain date, that should be an important target - no new costs should be charged to the project after that date.

1.4 Project Management Organization

The management organization should be tailored to meet the needs of each particular project. Each project is different from all other projects.

For a larger project which involves a considerable amount of money and activity, five levels of management and supervision may be considered. Beginning with the highest level of authority these are:

1. Chief and council;
2. Building committee;
3. Project manager;
4. Construction manager; and
5. Supervisors.

Note: *It must be kept in mind that all these management positions are not necessarily full time commitments (e.g. The chief and members of the council will have many other responsibilities. It is also common for one individual to be the project manager for a number of different projects).*

As well, different First Nations or tribal councils organizations may prefer to use different arrangements and titles, however, the organizational concepts should be the same.

The project manager is the person responsible for implementing the project; however, he or she obtains vital support from others in the management organization. The chief and council must view the project in terms of its primary objectives plus its long term implications and relationships to other projects and programs. Each supervisor on the construction site must be concerned with the physical details of the construction today and how it will affect tomorrow. The building committee and construction manager play important roles in providing links between the project manager and the chief and council on the one hand and the supervisors on the other. The three organization diagrams and remarks which follow give a few examples of the types of organizations which can be used.

Figure 1 depicts an organization diagram typical of the management structure which could be set up for a large project where the bulk of the work is being carried out by day labour.

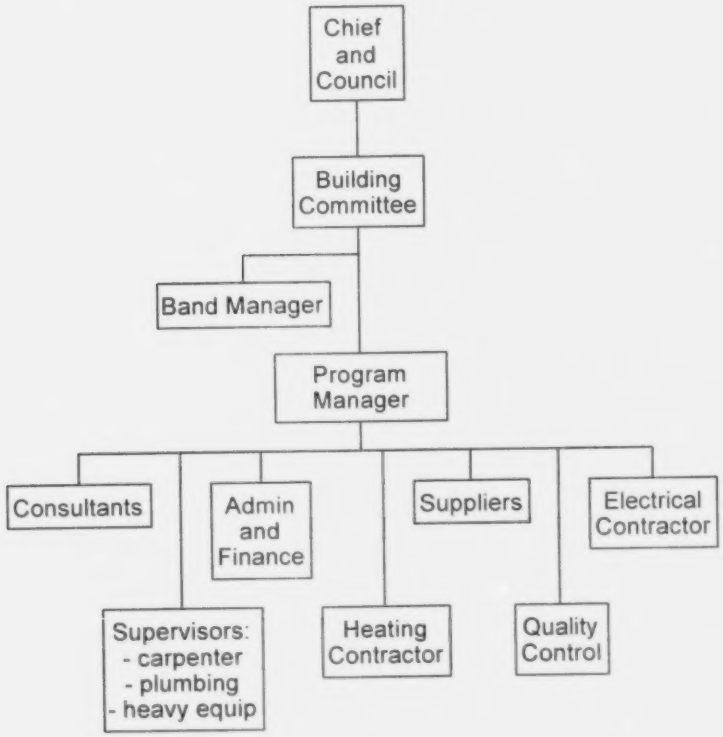


Figure 1: Management structure of a large project using day labour.

Features of this organization include the following:

- The project manager is responsible to one organization only - the building committee.
- The band manager does not have any direct responsibility for the project but plays an important advisory role to both the project manager and building committee.
- The project manager has an important co-ordination role to play as the link between those who actually do the work (e.g. construction manager, supervisors, contractors, consultants) and those who decide what is needed and authorize the overall expenditure (e.g. chief and council).

In **Figure 2** the organization depicted may be considered appropriate for a large project where the bulk of the work is done by contract.

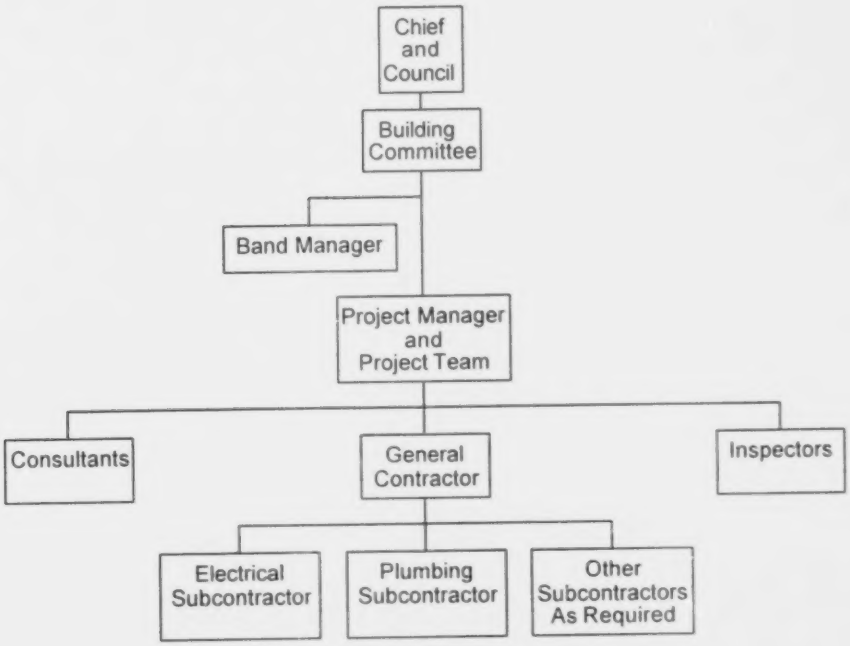


Figure 2: Management structure of a large project using contractors.

Features of this organization include the following:

- There is no need for a construction manager or supervisors because the work performed by these people is the responsibility of the general contractor.

- The project manager uses various inspectors (e.g. qualified trades people, separate consultants, government inspectors etc.) to inspect the contractor's work to ensure it is satisfactory in terms of the contract.

The organization shown in **Figure 3** could be used for a smaller project which is carried out by day labour.

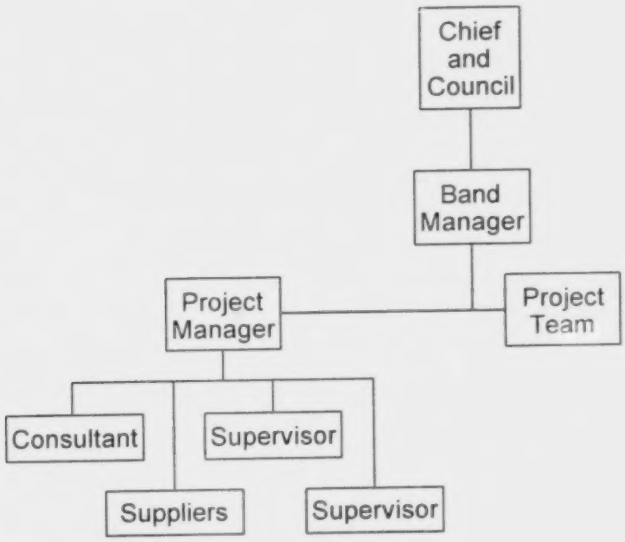


Figure 3: Management structure of a small project using day labour.

Features of this organization include the following:

- The Chief and Council employ the band manager in a direct management role (the project manager works for the band manager rather than a building committee).

- Because the project is smaller the band manager will normally use band staff to provide the project manager with administrative and financial support.

- The project manager is directly involved with the construction supervisors. In this case, the project manager plays the role of the construction manager as well.

The type of organization set up by a community to manage a project is important. While flexibility and tailoring each organization to suit the special circumstances of each situation is important, the following guidelines apply:

1. The fewer persons and management levels involved in a decision the quicker the decision can be made.

2. Each project management organization should exist only for one project - when the project is complete the organization is dissolved.

3. Each person should have only one supervisor (one boss).

4. While the one boss principles applies, flexible procedures for co-ordination and communication are important.

1.5 Project Team

The previous section discussed different types of organizations which the community leaders can put in place to manage projects. These organizations are important because they provide projects with a decision making process and direction. In addition to this organization, the project manager needs a second flexible and responsive management group which can deal with detail, provide expertise in different areas and, in general, get the job done. The answer to this requirement is the project team.

The project team is a group of persons who collectively have the interest, knowledge, and authority to take the action required to accomplish the project in accordance with its objectives. The project manager is responsible for the project, but he or she obtains help from the project team.

The project manager should organize the project team. The following persons would typically be on it:

1. the project manager (chairperson);
2. chief and council (represented by a member of the building committee);
3. persons with specific expertise or interest in the end use of the project (e.g. principal of school, activity program manager);
4. consultant;
5. contractor;
6. construction manager;
7. community maintenance superintendent; and
8. representative from any group with a major financial or other legitimate interest in the project.

The project manager must remember the project team is in fact a "team". Collectively, the members

must provide the advice, authority and energy to get the job done, and the group must be able to work together. They must be willing to co-operate and have their activities co-coordinated by the project manager.

The project team need not be a static group that never changes. Members may be added or subtracted as the need for specific areas of advice or authority arise. For example, it would be reasonable to assume that the project manager and building committee representative would be permanent members of the project team but others (e.g. contractors, suppliers) would only have an input during certain parts of the project. Aside from the fact that members of the project team will have other things to do, the project manager may find that involving too many people delays decision making and increases the possibility of non productive interpersonal conflict.

As noted earlier, every project is somewhat different, and needs a project team designed for the specific circumstances.

The project team should meet whenever there is a good reason to get together; however, monthly meetings should be normal when the project is active. In addition to regular meetings the project manager can meet individually with members of the project team when a point arises that requires immediate attention.

1.6 A Step by Step Process

1.6.1 The Concept of Phases

In a previous section it was noted that getting the project done successfully is a matter of achieving the time, cost, and quality objectives. To do this, project management provides a step by step process (called phases) for the project manager to follow. Each successive phase involves a group of activities that the project manager ensures are carried out.

The five phases of a project are:

1. initiation;
2. planning;
3. design;
4. construction; and
5. takeover and in-service.

Parts 2 through 6 discuss each of these phases in detail, but essentially the work which must

be carried out in each is briefly outlined below. As well, Appendix A contains a "Sample Project Management Check List" which project managers will find useful as a quick reference.

1.6.2 Initiation Phase

The initiation phase of a capital construction project is carried out by community leaders and it consists of the following activities:

1. Community needs are normally identified based on a community plan which has been accepted by community members and adopted by the band council.

2. Projects identified are ranked by importance.

3. Once a decision to implement a project is taken, a statement of the aims (e.g. functional, cultural, social, economic etc.) is developed.

4. The project is expressed in broad terms of its cost, time, and quality objectives.

5. The necessary resources for the project are identified.

6. A project manager is hired.

1.6.3 Planning Phase

The planning phase is carried out by the project manager with input from the project team. It consists of the following activities:

1. The broad requirements set in the initiation phase are developed into a well defined plan by carrying out such things as feasibility studies, life-cycle cost studies, environmental studies, and option analysis.

2. A balanced and detailed perception of the project is obtained by collecting a broad range of information and opinion (e.g. consulting special interest groups, conducting open meetings, obtaining the views of groups who have completed similar projects).

3. A project scope is developed.

4. The time, cost and quality objectives are more precisely defined by developing a project outline, schedules, cash flow requirements, construction implementation plan, and operation and maintenance training plan.

5. The necessary approvals and funding are obtained.

1.6.4 Design Phase

The design phase consists of the following activities:

1. Well defined terms of reference are prepared for the design consultant. This will include consideration of such things as restraints (e.g. budgets, deadlines, special considerations) and requirements in terms of carrying out the construction (e.g. drawings, specifications, bills of material, day labour plans, inspections).

2. Design proposals are invited and evaluated.

3. A design consultant is selected and retained.

4. The design and more accurate cost estimates are undertaken by the consultant. Approvals as required are obtained.

5. The design is reviewed at the 30%, 60% and 90% completion stages.

6. The design is completed.

1.6.5 Construction Phase

The construction phase of a project may be carried out by either day labour or contract. The following activities are involved with day labour:

1. The day labour plan is prepared.

2. Material and equipment are obtained.

3. Personnel (e.g. supervisors, support trades, labour) are hired.

4. Construction is carried out.

5. The work is managed by comparing actual progress with the planned time, cost, and quality objectives. Such managements aids as inspections, reports, and meetings are utilized.

6. All inspections are completed and the work is finalized.

When construction is by contract the following activities are involved:

1. The contract tender package is prepared.

2. The contract is tendered and awarded.

3. The construction is inspected and the contract is managed in accordance with its terms and conditions.

4. The project is accepted subject to completion of a deficiency list.

5. The final acceptance is made.

1.6.6 Takeover and In-Service Phase

The takeover and in-service phase consists of the following:

1. As built drawings are completed and filed.

2. Arrangements are made to carry out warranty checks.

3. Arrangements are made to carry out the ongoing operation and maintenance.

4. The completion report is prepared.

1.7 Why Use Project Management?

The project manager and chief and council must be strongly committed to meeting the objectives of the project. They must be prepared to stick with project management procedures even when it means changing the way of doing things and making some unpopular decisions. Two questions often arise: "Why use project management procedures at all?" or "What benefits will project management bring to the community?"

The answer to the above questions is simply that using project management principles works. Over the years, private enterprise and government organizations, at all levels, have found that when clear objectives are set and good project management procedures used, cost overruns, frustrating delays, and poor quality are either greatly reduced or eliminated. Perhaps even more important, the money which would otherwise go into cost overruns can be used to provide other needed services. More and better facilities are obtained at the same price.

1.8 Communications

1.8.1 Communications and Project Management

One of the project manager's most important jobs is to provide the leadership, persuasion and motivation needed to get other people to do the right thing at the right time. The project manager must work with many different people (e.g. chief, councillors, supervisors, suppliers, day labourers, contractors, project officers, band managers, etc.) who are involved in a project. Good communication is therefore one of the most important management skills that the project manager must have.

Individual communications skills can be developed through work and practice. However, even a new project manager will obtain acceptable results if the ideas outlined in this section are followed. The three common forms of communication (e.g. meetings, written communications and verbal communications) will be discussed in turn.

1.8.2 Meetings

Meetings are one of the best and quickest ways for the project manager to bring the right people together to pass or receive information, conduct creative thinking sessions, find solutions, make decisions and give instruction.

Meetings must be used wisely because they are time consuming. It is essential that each meeting be made as effective as possible. The following are suggestions the project manager can use to get the best results out of each.

A meeting must have a purpose. If there is not a good and specific reason to hold a particular meeting then it should be cancelled. Consider combining agenda items at a meetings to save time if the same essential people are involved.

Prepare an agenda beforehand. A copy of the agenda should be given to all attendees before the meeting so they can prepare themselves. The agenda should contain a clear statement on the purpose of the meeting, the topics to be discussed, the decisions which must be taken, and any time limit on discussions. The project manager must discourage digression and stay focused on the agenda. (Note: The chairperson should provide the opportunity for each attendee to recommend agenda items prior to preparing it). If time permits, additional items may be introduced and discussed after all scheduled agenda items have been dealt with.

Each meetings must have a leader (e.g. chairperson). This is normally the project manager but it can be someone else. In addition to sticking to the agenda the chairperson must be objective; able to get others to give their honest reaction and comment; control discussion even when people attending the meeting are of higher status, emotional, or talkative; summarize other person's statements without bias; have the ability to move on by changing the subject; and

recognize the key issues involved. It is important to choose the participants for a meeting. At times, people who have the most to contribute may try to avoid attending because they feel they are too busy. The project manager should obtain a commitment from these people and take reasonable steps to not waste time and make the meeting as convenient as possible. The opposite and perhaps more serious problem is that

too many people will attend. Persons may wish to attend a meeting simply to obtain information or have the prestige of participating. As well, persons who wish to influence a decision may arrange to be joined by others who will forcefully argue in favour of their point of view. The more people attending a meeting the more difficult it will be make decisions. Participants at meetings should be limited to those who can contribute and add constructively to achieving the project objectives. Note: What is said in this paragraph should not be confused with the important need to provide for input from all interest groups early in the project initiation and planning phases.

It is important to control the duration of a meeting. Little additional productive results can be expected from a meeting after it runs two hours.

A meeting should have a secretary or recorder. The project manager should arrange to have someone take and write the minutes of the meeting. If assistance is not available, the project manager will have to take sufficient notes so that the minutes can be written when the meeting is over. Minutes need not be long but they should, like the meeting itself, be well planned. Essential points made, decisions reached, and who is to take action should be recorded. The project manager should distribute draft copies of the minutes to everyone who attended the meeting so any errors or misunderstanding can be corrected before the minutes are finalized.

The effort put into organizing and conducting a good meeting is lost if there is no follow up. The project manager will get the reputation of one who is effective and gets things done if completion of the action items in the minutes are vigorously pursued. This will often require direct as well as indirect and subtle forms of pressure to get those persons responsible to act.

1.8.3 Letters and Report Writing

Written communication, like letters, diaries and reports, have several important functions. They provide a record of what has been said, and help create understanding between individuals. A person or firm is much more likely to react positively when a conversation (e.g. a discussion, a request, or a telephone conversation) is followed up with a written letter or note. The project manager who does not have a written record to prove a case or verify a position is not likely to make a convincing argument with the chief and council, a supplier, a lawyer, a contractor or representatives of funding organizations. Memories, even with the best of intentions, are short. A busy project manager who has many things to look after will quickly forget an item unless it is written down. Unless recorded, a contractor may quickly forget or change the promises that were made during negotiations.

Good written communication is often considered as being too time consuming, too difficult, or unimportant in comparison to the other things which are happening on a project. This is a mistake. Project managers will not be able to deal with claims or have continued control if this management tool is not used productively. The preparation of written documents (e.g. letters, minutes, reports) can be done rather quickly if they are kept to the point and completed while details are still fresh in the mind of the writer.

1.8.4 Verbal Communications

Verbal communication has a number of advantages. It can be done quickly, and it provides the opportunity for immediate feedback. When the communicator gets immediate feedback from the person spoken to, a more effective transfer of information will be the result.

Verbal communication does have limitations and its effects will diminish when it is overdone. As well, verbal communication cannot be verified at a later time, and it is more likely to be forgotten or ignored.

1.9 Files

One of the best ways for a project manager to keep well organized and in control is to maintain a good project file. A project file is a collection of papers and documents stored in some logical way - usually in order of the date they were received or completed.

A well kept project file should provide or contain the following:

1. a means of familiarising a new person with all the important facts, decisions, and objectives concerning the project;

2. copies of all the principal documents (e.g. approvals, letters, minutes, forms, agreements, resolutions) pertaining to the project;

3. a well organized record of the project's history and current status;

4. an accounting of the resources consumed on the project;

5. sufficient detail on the project so that it can be verified by auditors; and

6. sufficient detail so the project manager can document important events and circumstances should legal problems or disagreement concerning the project arise.
   A well maintained file should contain all the important documents on a project; however, the physical size or bulk of certain items (e.g. drawings and specifications) may make this impractical.

Information on other project studies or records may not be available to put in the file. In such cases, the project manager should place a note in the file indicating that this information exists and where it may be found. In some cases the project manager may find certain types of bulky information such as daily reports, labour or material usage forms, and invoices, are best placed in the project file in summary form (reports or roll ups prepared each
week or month) with a cross reference to where the detailed information can be found and verified.

While no hard and fast rules can be made, the following is a list of the typical documents which a project manager should have on file:

1. Band council resolutions;

2. Contribution arrangement/letters of acceptance;

3. Correspondence;

4. Environmental screening study;

5. Feasibility studies;

6. Estimates;

7. Work schedules;

8. Drawings and specifications (if small enough);

9. Consultant selection documentation;

10. Tender call documents;

11. Contract documents;

12. Special, monthly or weekly reports and schedule updates (e.g. status and control on the time, cost, and quality objectives of the project);

13. Authorized change orders;

14. Interim and final certificates of completion;

15. Warranties/guarantees;

16. Completion reports;

17. Log of telephone calls, site visits by officials, weather, or any other circumstances which are unusual or important to the progress of the project;

18. Minutes of meetings; and
19. Job descriptions for the project manager and other key people involved in the project.

The project manager may find that his or her file is not the only one being maintained on the project. Other persons (e.g. chief and council, band manager, project officer, construction manager, contractors) will likely maintain their own files. However, the project manager must ensure that his or her project file is always complete.

1.10 Personal Computers

Although not essential, the use of personal computers can greatly speed up and improve the quality and appearance of work (e.g. planning, charting, corresponding, budgeting) which must be done to support a construction project. However, similar to a manual approach, the quality of the work the computer does is only as good as the information fed into it.

A number of "project management" software packages are available commercially which may greatly assist the project manager. These software packages should be carefully screened before any investment is made as an individual program may or may not suit your needs. Also, standard software packages for word processing and spread sheets may do most of the work required.

The computer can be a great labour saving device and management tool, but for a novice, it requires an investment of time and practice to become proficient in its use.

Part 2: Initiation Phase

2.1 General

Community leaders must personally carry out most of the work involved in the initiation phase. Therefore, this Part will be of particular interest to them.

A community, be it large or small, needs planning insofar as construction is concerned. There are always questions which require answers (e.g. What is needed this year? What is needed in ten years time? Among the different things needed what is the most important? What will a project cost? Where will the money come from?) Decisions have to be made on the best ways to satisfy the common good under the circumstances that exist.

Few if any communities ever have the resources to provide all the facilities that are needed. For community leaders it is a matter of making the best possible use of the resources available. The most important needs must be identified and the existing resources must be used to satisfy them in the most efficient and effective way possible. This requires good planning.

2.2 Community Plans (Capital Plans)

To help community leaders make important decisions, many communities have developed community plans. It is not the purpose of this manual to discuss community plans in detail because they get into areas such as economic planning, education, and cultural development which are outside the scope of capital construction project management. However, one of the important functions of a well prepared community plan is to identify building and infrastructure requirements. The community plan is normally prepared by consultants who are retained by community leaders to make a detailed study of the conditions and life expectancy of facilities, and the probable growth and development patterns of the community.

Once existing facilities and needs are known, the real work in developing a good community plan begins. The first task is to take the list of requirements and rank them in order of priority (e.g. decide what is the most important project, the second most important, the third, etc.). It is normal for consultants to make professional judgements in this area; however, they must work in close co-operation with the community leaders. It is important to remember it is the community leaders who are faced with the real decisions. They must judge the recommendations made by the consultants from the perspective of persons who are not only responsible for, but also sensitive to the political, social, and cultural aspirations of the people and the community they represent. The community leaders must gain acceptance from community members for the plan, and they usually

adopt it in some formal way.
The well prepared community plan will establish approximate costs of projects and estimate the probable funding levels which will be available to undertake them. This is a very important step because a community plan which only produces an unrealistic wish list will build false expectations and subsequent frustrations. The aim of a good community plan is to try to get the most important things done. It is a mistake to believe everything will happen just because a community plan was prepared.

Community plans, like all other plans, are only based on the information available at the time that they were prepared. Community administrations change, people's wants and needs change, circumstances do not develop exactly as planned, and resource levels change from those predicted. Therefore, the community plan should be updated from time to time. It should be an evolving document which reflects current circumstances. Otherwise, it will quickly become outdated and of limited use. A good community plan should not require major changes, but rather, ongoing fine tuning. Changes for change's sake can lead to unnecessary expense and failure to follow through with any concrete action.

The project manager and community leaders should guard against the common tendency to either skip planning steps or consider good planning too detailed or time consuming. This can be a serious mistake because planning not only establishes a logical sequence for the community to follow to achieve objectives but it automatically forces the decision makers to become very familiar (e.g. experts) with what must be done.

2.3 Project Selection and Priority

A fundamental responsibility for community leaders is to establish priorities for project implementation in order to address the many competing requirements. In many cases, the community leaders can be aided by a community plan like the one discussed in the previous section. In some situations, a community plan is not available. This means that the community leaders will have to be more careful, have more discussions, and obtain more information before making a decision. It is quite normal, at this stage, to seek professional advice to help decide what is required and the probable costs.

2.4 Definition of Project Aims

A mistake commonly made in the early stages of a project is not to decisively deal with basic issues. Failure to foresee or deal with those basics can mean the project will probably run into trouble during its implementation, and it will not achieve the goals the community leaders have for it.

Making a thorough analysis of a project at the early stages requires an ability to recognize the situation as it really exists. To use a new school as an example, it could be described as a building on a piece of land. However, it is in fact much more than that. The more obvious thing is that it is a

place to educate children not only in the immediate future, but chances are, over the next 20 to 30 years the same facilities must be adapted to changing educational requirements. The new school may be a focal point for other community activities in the evenings, weekends and summers. The construction of the school may involve important considerations in terms of creating local employment and training activities. Adult education and cultural development may be considered in planning educational facilities. Financial and design restraints will most likely exist. Maintenance and operation money must be available for the structure every year. These are only examples of factors which must be considered because any one of them can greatly influence how or when the project is to be completed. Some fundamental trade offs may be necessary.

To be as sure as possible that they have thought of everything, community leaders should seek information and advice from every reasonable source. Using the new school example, people involved in a similar project in another community would be a good source of advice and the assistance of professionals in the education field is a must. All the members of the community, either through their councillors or in open meetings, should be given the opportunity to voice their opinions. Senior officials involved in technical and financial approvals can offer good suggestions in the early stages of the process. The aim is to identify and highlight all the facts. Community leaders will likely not be able to accommodate every requirement identified. The desirable will have to be separated from the essential. However, they can make decisions secure in the knowledge those decisions are based on an understanding of all the important issues. The building committee, introduced in Part 1.0, can be put to good use in carrying out this type of work.

2.5 Project Impacts

Similar in importance to identifying all the aims of a project is to identify the technological, economic, and social impacts that a project may have on a community. For example, a new building or group of buildings may require additional or modified facilities for fire protection. Existing roads and utilities (e.g. electrical, water, sewage) may not be able to handle the new facilities. Concentrating people in one location or creating attractive new facilities may produce security problems which must be dealt with. Introducing new technological systems may require more training or different qualifications for existing maintenance staff and operators.

2.6 A Broad Perspective

The two previous sections emphasized the importance for community leaders to identify the project's aims and impacts during the initiation phase. The community leader's objective is to think of all the ramifications, keep a broad perspective and open mind. At this stage, it is usually not wise to become involved in detail. Detail will be made the responsibility of the project manager in the planning and later phases of the project.

2.7 Definition of Objectives

2.7.1 The Project's Objectives

After addressing the broad considerations discussed in the earlier sections of this Part, the community leaders should, however, decide what they want in general terms. They are in a position to describe the project, for the first time, in terms of its time, cost, and quality objectives. However, it is important to maintain flexibility going into the next phase (i.e. the planning phase), so that when adjustments are needed, major changes or unpleasant surprises will not occur.

2.7.2 Time

Time is an important factor in determining major milestones. For example, how long will it take to obtain agreement in principle from all the agencies who must approve the project? What time is required to get any necessary financing in place? The time that engineering studies will take, hiring a design consultant, preparing the design, hiring a contractor or purchasing materials, hiring a labour force, completing the construction, and getting the facility ready for use must all be considered. Such things as climate (e.g. wet or cold areas) or location (e.g. materials must be moved in by barge or winter roads) may require additional time.

In determining time, it is not necessary to be overly precise at this stage; however, community leaders should be careful to be realistic. The phases of a project that come before construction take a surprisingly long time. When several different organizations must look at a proposal or if a change in community leadership is involved, it is not unusual for the process to take many months before the project is fully considered, correspondence is completed, and all the questions are answered. It can take up to three or four months to hire a design consultant, and the design itself can take six months to a year, if any unusual problems or extensive investigations must be made. Construction, depending on the method chosen to do the work, the geographic location, and climate, can take two or even more years, if a big job is involved. Persons involved with their first project tend to underestimate the time required or are convinced their project will be the exception which is completed in record time.

2.7.3 Cost

As well as the time considerations, the community leaders must obtain an estimate of the cost. They will want this cost in terms of a cash flow and a combined estimated total cost. This cost information will give one of the first indications that the project is actually feasible in terms of the financial resources available.

The cost estimate at this stage will only be a rough order of magnitude (remember: few details or even how the work will be done is not yet known) which should be obtained at little or no expense. There are a number of ways to obtain this information. For example, if a neighbouring reserve or other community has completed a similar project under similar conditions in the last

couple of years, their actual cost plus an allowance for inflation increases could provide the information needed. Persons in the construction business (e.g. contractors, consultants, construction boards, material suppliers) can often provide very good information for little or no cost. Staff at regional offices of DIAND have access to cost information on recent projects plus a cost reference manual (called TSD-19-1, Cost Reference Manual) which contains estimates on the typical types and sizes of facilities built in First Nation communities across Canada.

The first estimate established by the community leaders is the first of four successive estimates normally prepared before a project enters the construction phase. This first estimate is called a "level four" estimate. It is often referred to as a "ball park" or "order of magnitude" estimate. Within the Federal Government, it is called a class "D" estimate.

2.7.4 Quality

Along with time and cost, it is also necessary to establish a quality objective. While it likely will not be possible to describe a specific facility, it will be possible to describe the project in general terms (e.g. five classroom school with a gymnasium and industrial arts facilities, or a sewage treatment plant to serve a specific current plus future need). It must be noted the term "quality" includes the concept of work scope and size.

2.7.5 The Project's Initial Description

By now, the community leaders have defined the community needs that the project must satisfy. As well, the project will have been given some concept of shape and size by defining it in terms of time, cost, and quality objectives. For example, a First Nation community which plans a new water distribution system and fire fighting capability might, at this point, describe the project as follows:

A water distribution system will be designed and installed with services to all homes within the area bounded by the Fishnotbiting River on the south, Sundown Street on the west, Sunup Street on the east, and the Neverontime Rail Line on the north. The system will meet established domestic and fire fighting requirements. All applicable codes will be adhered to. The system will be completed and in operation no later than 30 months from this date. The total cost will not exceed two and one half million dollars. At least 80 percent of the labour costs will be carried out by residents of the community.

This description, while brief, gives the project's aims and a clear outline of time, cost, and quality objectives. Because the objectives are based on preliminary data, they may have to be adjusted when more detailed information has been developed. Nevertheless, these objectives provide the community leaders with specific terms by which the project can be planned and controlled.

Once the time, cost, and quality objectives are set, the community leaders have something concrete to work toward. This is the first plan of what is to be done and the objectives are expressed in quantities (e.g. actual dates, dollars, and a physical size) which can be measured.

2.8 Resources

2.8.1 A Key Decision Point

Although little, if any money has been spent on the project to this point, available resources would have been an important topic of discussion. Assuming that all the preliminary work has taken place, the project has now reached a major decision point. Going beyond this point in development of the project will require a commitment of resources -- normally money. A principle, generally followed in project management, is to spend only what is absolutely necessary until there is agreement and commitment to proceed further.

The key requirement at this stage is for the community leaders to obtain firm commitments (Band Council Resolutions, letters signed by the appropriate authorities such as band chief or band manager, bank manager, tribal council, capital contribution arrangement with DIAND) that the necessary money will be available. Without this commitment from those who exercise various degrees of control over the project, it should not proceed. Negotiations to provide additional information or adjust the project's aims or objectives at this time are not unusual.

At this point, it may be necessary to obtain the authority and funds needed to complete a more accurate estimate (the third level of estimate which will be discussed in the next Part) and do special studies to get a better overall understanding of the project. The penalties -- in terms of wasted money, effort, as well as the need to live for years with new facilities which may not be well suited for their purpose -- are high if care is not taken. It is worth the trouble to double check details at each stage to ensure that the right decisions have been made to protect everyone's interests.

2.8.2 Hiring A Project Manager

A major decision point has now passed. The project has gone through the discussion stage to a point where it should become a reality. The community leaders should now carry out the very important job of hiring a project manager. They want someone to whom they can delegate authority and responsibility to achieve the project's time, cost, and quality objectives. Putting it another way, the community leaders should use the time, cost, and quality objectives to manage the project manager while the project manager should use the same objectives, expressed in more detail, to manage the project.

The size and complexity of the project will dictate the education, qualifications, management and technical experience the project manager needs. It is normal practice to have a professional (e.g. engineer or architect with the necessary management experience) to manage large complex projects. Smaller or simpler projects may call for a lower level of expertise (e.g. technician or tradesperson with experience and management skills). Because choosing the right project manager is so important, community leaders should seek advice if they are unsure of the type of person they need.

Project managers should be hired on the basis of a carefully prepared job description which

outlines the project manager's duties, authorities, and responsibilities in clear and concise language. There should be no doubt about what the community leaders want the project manager to do. Appendix B provides a sample of a job description that could be prepared for a project manager hired to manage the building of a new school. Some communities may choose to use a consultant firm to hire their project manager. Using consultants is discussed in Part 4.0. Hiring of consultants is discussed in detail in CN2 Contract Administration Training Publication, *"Contracting for Professional Services by First Nations and Aboriginal Communities."* This publication will be referred to later in this manual as CN2.

The project manager must, of course, read and agree to the job description before accepting the job. The job description is the basic contract between the project manager and the community leaders. Both sides know and agree to what's expected. Both should sign the job description. Chiefs and councillors may wish to limit the amount of authority given the project manager. While this is a decision which must be made by them, these considerations should be kept in mind:

1. Generally, the more authority the project manager has the easier it will be to achieve the project's objectives.

2. One cannot have responsibility without the corresponding authority.

3. One cannot be held responsible if someone else can make changes which have not been agreed to.

Note: Project management is now recognized as a separate and specialized occupation. Project managers have organized a Project Management Institute which sponsors regional organizations in all the major centres in the United States and Canada. Along with articles on project management, the Project Management Institute has printed in their journal their "Code of Ethics" which was developed by their standards committee.
(See Appendix C). For more information on the Project Management Institute contact:

Project Management Institute
P.O. Box 43
Drexel Hill, P.A.
U.S.A. 19026
Telephone: (215) 622-1796

Part 3: PLANNING PHASE

3.1 General

As seen in the last part, the initiation phase ends when the community leaders decide that the project will actually be undertaken. They develop the general concept of what it will cost, when it must be finished, and what work will be involved. As well, a project manager has been hired, and this person has agreed with the council or building committee that the scope, time and budget can be achieved. From that point, the project manager manages the project on the communities' behalf.

This part on the planning phase will discuss the project team, the implementation plan, typical studies and analyses (e.g. feasibility studies, option analysis, life cycle costing analysis) needed, schedule preparation, estimates, plus the design and construction plan. The planning activity during this part of the project involves a process of examining what the community leaders have decided, adding or subtracting detail, and then reconfirming it with them. The work done by the community leaders in the initiation phase, the plans made by the project manager in the planning phase, and the design prepared by the design consultant in the design phase are really only progressively more detailed plans for achieving the same objectives. This careful approach keeps adding detail and rechecking the validity of what is planned and decided upon so the chances for having a successful project are maximized.

The requirement to hire consultants to perform certain services is mentioned several times in this part. Part 4.0 discusses procedures for obtaining such services. While this part describes specific topics (e.g. feasibility studies, estimates, schedules) as though they were isolated functions, all these activities are closely related and interdependent.

3.2 Project Team

One of the first things the project manager will do after taking responsibility for the project is to organize the project team -- assemble a group of people who will collectively have the knowledge, influence, authority, and other skills needed to get the job done. The make-up and role of the project team was discussed in Part 1.0.

The project manager should meet with the project team as early as possible. The items covered should include:

1. a complete review of the project including objectives and other available information;
2. the priorities and problem areas as seen by each person;
3. action plans for the project and project team; and
4. the role and responsibilities of each team member.

Co-operation and acceptance of each member's responsibility and role are essential for the success of the project team. The project manager should keep in mind that some difference of opinion among team members, if it is kept constructive and impersonal, can help the project because it ensures that issues are thoroughly discussed and balanced decisions can be reached.

The project manager should keep in frequent contact with team members and use their advice and input to the maximum.

3.3 Implementation Plan

3.3.1 Elements of the Plan

As was noted earlier in this manual, one of the important things a project manager must do is ensure that there is good communication, because misunderstanding and different perceptions can be common even among persons who receive the same information. One of the key ways to do this is to arrange and record all issues (e.g. project objectives, delegated responsibilities, authorities, plans for future action) in a single document, and have this document approved by all the appropriate authorities (e.g. chief, heads of agencies making a financial contribution to the project, the project manager, etc.). This document then becomes the implementation plan (often called the implementation brief). Remember poor or insufficient planning is one of the major reasons projects fail (e.g. do not meet their objectives).

After preliminary investigation by the project manager and meetings with the chief and council and project team, the project manager is in a position to start preparing the implementation plan. There is no set way to prepare it because each implementation plan must suit a particular set of circumstances. In general, an attempt should be made to keep it as short and concise as possible while clearly setting down the main points (remember those reading and approving the document are interested in the key issues and not detail). While the project manager might want to emphasize other things, the following topic headings would be appropriate in the majority of instances:

1. quality objective;
2. time objective;
3. cost objective;
4. the project team make-up (with statements of duties);
5. plans for the planning phase;
6. plans for the design phase;
7. plans for the construction phase;
8. plans for the take-over and in-service phase; and
9. a sign-off (i.e. approval) sheet.

3.3.2 Objectives and Project Team

Points recorded under each heading in the implementation plan will be discussed in the remainder of this part.

a) Quality Objective: At this early part of the project, it may only be practical to state the need in a clear statement such as "supply each home, community building, and place of business on the reserve with a source of clean, safe, running water". The chief and council may have placed riders or restrictions on what is to be done or options may have to be identified. These should be stated.

b) Time Objective: Some concept of a reasonable schedule for project implementation and completion should be known at this time. As well, the chief and council may have imposed a strict deadline or other circumstances (e.g. an emergency situation, the weather or climate) may dictate limitations on the time objective.

c) Cost Objective: Cost information will probably be confined to a "level four" estimate (e.g. ball park) at this point. Information on any cash flow restrictions should be noted. Plans for developing more precise estimates should be outlined.

d) Project Team: Members of the project team should be indicated by name and position. The key members who will stay on the team throughout the project's life should be noted separately from those who will be members only during certain periods (e.g. design, construction, contract award). The responsibilities of each key member of the team may be attached as an annex to the implementation plan.

3.3.3 Planning the Phases

Having recorded established information (i.e. the objectives and project team) in the implementation plan, the project manager must now decide what will happen in the future. The project manager may use a number of sources of assistance in doing this (e.g. his or her own experience and training, discussions with the chief and council, project team members, project managers from similar projects, consultants, contractors, and suppliers. Planning points considered could include the following:

a) Planning Phase: The planning phase consists of obtaining and refining existing information. It may be necessary to identify alternatives and pick the best solution from among different courses of action. This will require option analysis. If there are questions on whether or not a particular solution will work, a feasibility study may be needed to decide. Some projects may affect the environment, so an environmental assessment will be needed. The total costs (e.g. planning, design, construction, operation, maintenance) for the entire life of the facility will be a key issue which
must be examined. Therefore, estimates and a life cycle cost analysis must be prepared. A schedule for implementing the design and construction phases will be needed. (Note: The remainder of this part discusses what is involved in each one of those planning phase activities).

b) Design Phase: The project manager must put forward the strategy for channelling the ideas, plans, and objectives for the project (i.e. an approved design and construction plan) into specific technical direction. This work is normally done by a consultant. Part 4.0 discusses the subject in detail.

c) Construction Phase: The construction phase consumes the bulk of the money involved in a project and normally receives most of the attention. Items the project manager must plan include how the work will be done (e.g. contract, day labour, or a combination of both), whether a construction manager will be needed, what special construction problems (e.g. winter roads or lack of skilled workers) must be accommodated, and how control (e.g. cost and quality) will be maintained. Part 5.0 discusses the construction phase in detail.

d) Take-Over Phase: The project manager must plan for the future operation and maintenance of the new facility, advanced training for the operators or maintainers, follow-up of the warranties and guarantees supplied with the construction phase, and measures to safeguard the as-built drawings and project files. Part 6.0 addresses those issues.

3.3.4 Sign-Off Sheet

The sign-off sheet is important to the project manager because it signifies that everyone who signed it agrees with the implementation plan. The sign-off sheet gives the project manager the authority to proceed with the project as outlined. Any problem or objection raised by the signers should be treated as an important matter which must be resolved before anyone signs. Only the key people who have authority to make commitments on behalf of their organization should be on the sign-off sheet. Examples of persons who could be included are:

1. the chief;
2. the project manager;
3. representative of any organization providing funding; and
4. head of end user group (e.g. the principal if project involves a school).

The project manager will undoubtedly work closely with the project team and carry out the necessary consultations with a variety of people when preparing the implementation plan. By preparing the plan, the project manager not only forces himself or herself to think and plan the whole process through carefully, but it also obtains a firm commitment from the key persons involved.

3.4 Environmental Screening

Over the past number of years, the public has become very aware of and concerned about the environment which is fragile and harm can be done by upsetting the balance of nature (e.g. adding chemicals, changing drainage patterns, clearing vegetation, burying solid wastes, operating equipment, interfering with wildlife, changing water use, etc.). Potential environmental problems must be considered on every project. The project manager should investigate what is required from the legal and funding requirement points of view. DIAND for example must refer to requirements under the Canadian Environmental Assessment Act (CEAA) or the Indian Lands and Funding Regulations (ILFR). Terms and conditions can refer to a specific environmental assessment process in the funding arrangement which must be carried out before commitments on funding can be made.

The project manager may require the assistance of consultants or other experts to complete the environmental assessment process. The project manager should be aware a good deal of advice, which is relatively inexpensive or free of charge, is often available from government agencies who specialize in this area.

3.5 Feasibility Studies

It is often necessary to determine if a particular course of action is feasible -- does it make sense -- can it be done? Feasibility studies are often needed on capital construction projects. Unless the project manager is knowledgeable about the types of construction involved, it is usual to obtain professional assistance with feasibility studies.

Examples of different types of feasibility studies can be given. Most involve questions pertaining to the most economical way to achieve project objectives. A transportation project involving a new road will likely involve feasibility studies (e.g. on the soil conditions, route location, legal survey, and sources of suitable road building material). If the community needs a new water supply, tests will be needed to find an adequate source with the necessary quality. The ground on which buildings are to be placed will require testing to ensure that the type of soil can bear the weight of the building and that the presence of rock will not make excavation exorbitantly expensive. The soil through which underground water or sewer lines will pass must be checked because construction costs involving extensive rock or a high water table can be very high in comparison to dry, rock free soil.

Feasibility studies can range from fairly routine (e.g. this is the case of most buildings where the design can usually be adjusted to accommodate the conditions), to critical in the case of transportation projects or utility lines, where the existence of bad soil conditions can multiply the cost of a project many times over. In some cases (e.g. where the feasibility studies are not critical or there is good evidence to support a suspected condition) the project manager may choose to include the requirement to conduct the appropriate tests as part of the consultant's responsibility in the design phase. On the other hand, some projects such as roads, water, and sewer services are so dependent on soil conditions that it would not be wise to complete the planning phase without first carrying out the necessary investigations.

3.6 Option Analysis

For most capital construction projects there are a number of possible ways to achieve the objectives. These different ways of getting the job done are called options. The project manager's task of identifying the best option is called an option analysis. For example, a community may need a new water supply. Possible water source options could include drilling deep wells, taking the water from a lake, or buying it from a neighbouring community. Options for a new school could involve bringing children to off-reserve schools, expanding and renovating existing facilities, constructing new facilities at a different site, etc.

It is important to think clearly and not confuse various factors when carrying out an option analysis. It has already been emphasized how important it is to set clear objectives (e.g. time, cost, and quality) and accompanying conditions (e.g. local employment issues, cultural requirements, community policy on financial transactions, political requirements) in the initiation phase. These are the ground rules on what the community wants, how much they are willing to pay, when the services or facilities are required. This information enables the project manager to make a judgement on whether or not a particular option is valid and worth investigating. If a course of action will satisfy the objectives and conditions, then it is a valid option.

Option analyses are often done as part of the feasibility study. Similar to feasibility studies, an option analysis usually requires the advice and assistance of professionals. Going back to the example of finding a source of water for a reserve, a consultant would have to check out each option carefully (e.g. is there sufficient ground water to supply a deep well, is the quality good enough for a community water supply, does the neighbouring community have sufficient capacity and pressure and are they prepared to negotiate a contract?). Answering these questions will require investigation.

3.7 Cost

While cost is only one of the three objectives used in project management, it is often the controlling consideration. At this stage in the project development, the project manager will be interested in cost from the perspective of developing a "level three" estimate (also referred to as a "C" level estimate), a cash flow plan, and a life cycle cost analysis. Each of these different ways of considering the cost will be looked at in turn.

The level three estimate is calculated by the project manager. It is a summation of all identifiable project costs. This is done by assigning each element or part of the project a cost based on a general analysis of what is involved (e.g. time, materials, unit costs, wages, cost of similar completed work). Compared to the "level four" estimate, the "level three" estimate is based on site information (e.g. the feasibility studies and option analysis are done) and a better understanding of the total project.

The "level three" estimate will be an important confirmation to the project manager and project team that estimated resources which will be required to implement the project, are realistic. In arriving at this estimate, the project manager should be guided by the principle that all legitimate and justifiable

costs should be included. High estimates should not be substituted for lack of sufficient research and planning because if this happens, the project may be cancelled or delayed by questions, explanations, rejustification and loss of the project manager's credibility. The same loss of credibility can take place when cost estimates are kept artificially low.

There are usually large sums involved in capital construction projects and paying out or receiving interest on this money, even for a few months, can involve considerable amounts. For reasons such as these, funding agencies (e.g. the First Nation, banks, Federal Government) are usually reluctant to make any more money available at any one time than what is immediately needed. The project manager must estimate the cash requirement for each month so that it will be available as required. This is done by means of a cash flow plan. The cash flow can normally be determined after the "level three" estimate and schedule (discussed in the next section) have been determined. As well, projects involving large Federal Government financial input will usually require what is known as 'preliminary approval" at this point.
Life cycle cost analysis considers all the costs of a facility from the time it is first designed until it is disposed of (e.g. torn down, sold, converted to another use) many years later. All associated costs (e.g. cost for design, construction, operation, maintenance, insurance, renovation and major overhaul, etc.) of the facility throughout its entire life are considered. A life cycle cost analysis can require answers to a number of important questions, e.g. is money available for planning, design, and construction; is it also available for yearly operation and maintenance; is it better to build a facility with a high construction and low maintenance cost or whether the opposite would be preferable; and how do options with different design, construction and maintenance costs compare financially.

Calculating life cycle costs requires a knowledge of what the various costs will be at today's rates plus adjustments to accommodate changes in inflation and interest rates in the future. Mathematical formulas to manipulate these figures are available which will tell the project manager the present worth (i.e. how much money would have to be available today to pay all the costs for the entire life of the facility) or future worth (i.e. how many dollars will be needed in some future year). This type of information is very valuable in making comparisons between options or budgeting the number of dollars which will be needed each year. The
project manager should be clear on what information is wanted from the life cycle cost analysis.

The most critical and time consuming task in doing a life cycle cost analysis is determining the work that must be done in each year of the facility's life and its cost in terms of today's dollars. Once this information is available, applying the mathematical formulas is a relatively easy process. Consultants or engineering staff will normally be required to complete a life cycle cost analysis for the project manager.

3.8 Schedule

The time objective for a project is established and controlled by a schedule. The project manager must establish a realistic schedule which identifies when the various project activities will be carried out. In the planning phase of a project, the project manager is interested in the major milestones or key events (e.g. how long will it take to complete the design, how long will it take to obtain approvals, how far the construction start dates must be pushed ahead or back to take advantage of good weather, what is the proper timing to get materials to the construction site by barge or winter roads, etc.). The project manager must develop a schedule which can be used for time control as well as establishing in the minds of the project team, chief and council, and other concerned parties what the lead times must be.

It is important for the project manager to be realistic when preparing the schedule. The same things which were said about the community leaders being aware of the amount of time it takes to do things, in Part 2.0, also apply to the project manager preparing a schedule. (Note: There is a natural tendency to be overly optimistic when planning and this leads to poor projections of time and cost).

3.9 Design and Construction Plan

Once all the information is available from the various feasibility studies, option analysis, cost estimates, and schedule, the design and construction plan is prepared. The design and construction plan is in fact an updated version of the implementation plan, and it is often called the project brief. The project manager may choose between writing a completely new plan (i.e. replacing the implementation plan with the design and construction plan) or simply updating or preparing an addendum to the implementation plan.

Basically, the design and construction plan sets forth in some detail the time, cost, and quality objectives. Each objective is supported (e.g. the time objective is supported with a schedule; cost is supported with such things as estimates, cash flow plan and a life cycle cost analysis; and the quality objective by feasibility studies, option analysis and outlined descriptions). Key decisions and commitments will be recorded.

The design and construction plan should be brief and to the point. All the important information should be laid out in simple clear language which does not attempt to conceal potential problem areas or overemphasize strong points. When the design and construction plan is completed by the project manager and forwarded for approval it should not contain any surprises or contentious issues. All these matters should be dealt with in the appropriate places (e.g. meetings, negotiations, letters of formal agreement, etc.) before the design and construction plan is completed.

The design and construction plan should have a "sign-off sheet" similar to the implementation plan. In most cases, the same people should be required to approve it.

Completion of the design plan provides the basis upon which Terms of Reference for the design can be completed at the beginning of the design phase. Objectives have been clarified and supported with detail, problems have been worked out, authorities have been obtained and the project is ready to be translated into the technical language which will be needed for construction.

Part 4: Design Phase

4.1 General

This part will discuss the project manager's duties during the design phase of a project. Reference will be made to CN2 which gives guidelines which can be used for hiring consultants (e.g. information on arranging a consultant contract and then administering it). These guidelines are commonly used in private industry and government. Project managers will find most consultants are familiar with them. (Note: The reader is urged to obtain and read a copy of CN2 in conjunction with this part).

On completion of the planning phase, the project is at a point where the objectives have been rechecked to ensure that they are realistic and expressed in specific terms. The services the project is to provide have been defined, plans have been outlined for the cost of each part of the project, the implementation method has been defined, and milestones for completing each phase or major part of the work have been set. All important issues have been defined and approved in the implementation and design and construction plans. The project manager, the project team, the building committee, and the chief and council should all feel comfortable with what has been done and be committed to press forward with the project.

The project is at a turning point in the design phase. All the ideas, concepts, outlines, costs and plans must be translated into technical details which explain to contractors and/or day labour personnel exactly what must be done. This transformation from general to technical is referred to as preparing the design. This is specialized work which is normally carried out by professionals and support staff (e.g. engineers, draftspersons, surveyors, architects, technicians) who work in firms or organizations which are commonly referred to as consultants.

When hiring a consultant, the community will have a contract which is a legal agreement committing both parties involved (e.g. the consultant and the community). The agreement (i.e. the contract) requires specific services be provided in exchange for a specified amount of money. Once the contract is signed by authorized persons representing both the community and the consultant, it cannot be changed without consent from both sides.

There is one important difference between hiring a consultant and a contractor. A contractor, as will be discussed in the next part, is told exactly what facilities must be constructed, whereas the project manager only knows in general terms what must be done when a consultant is hired. The project manager needs the consultant's imagination, experience and professional knowledge to turn the general requirements into a detailed design which can be used by a contractor or day labour work force to carry out the construction phase.
The project manager normally requests proposals from a number of consultants before one is hired. The following sections outline how this procedure takes place.

4.2 Hiring a Consultant

A consultant proposal is obtained by telling a group of selected consultants what is required and inviting them to submit a proposal on the services they can provide and what they will charge. This is known as inviting proposals. When a consultant responds it is known as a proposal.

In the proposal, the consultant will state how the firm will approach the job, ideas it has for providing a facility which will meet the objectives, how long it will take to prepare the design, the experience and qualifications of its staff, similar projects the firm has carried out, and last but not least, its fees for doing the work. It is up to the community, usually under the leadership of the project manager, to study the proposals and recommend which consultant they should hire. When this is done, a contract based on the consultant's proposal is signed. In some cases, the band chief and council may wish to make the final decision, or in other cases, they may have delegated this authority to the project manager.

When inviting consultant proposals, it would be useful to consult CN2. Plus other information. Parts 1.0, 2.0, and 3.0 of CN2 contains information on contracting definitions, preparation of documents, method of payment, amendments, receipt and opening of proposals, evaluation of proposals, award of contract and sole source selection. Part 4.0 addresses administration and management of the contract including insurance, change orders, default by the contractor, progress payments and evaluation.

One of the most important parts of CN2, as far as the project manager is concerned, is Part 2.2, Preparation and Distribution of Requests for Proposal Documents. It involves the project manager informing the consultant what is required. The project manager's skill in communicating clearly and completely is important. While consultants are professionals with trained and experienced staff, they must be told what the community wants. This includes the more common items like physical size, location, and budget. However, other details must also be covered (e.g. when the project must be complete, how the design will be reviewed and paid for, how the community wants the construction carried out, assistance the community requires from the consultant during the construction phase, and any training the community requires to be carried out). As well, the consultant must be told about the communities' cultural or other special requirements. While consultants must be told what is needed, they should be given latitude and flexibility. Good consultants are imaginative, well informed about a variety of current up to date technical approaches, and skilled at improving on the ideas presented to them.

It is often normal practice for the band manager to be directly involved in preparing the consultant proposals and contracts. In these situations, the project manager should assist in preparing the terms of reference and agree with what is being done. In other cases, the band chief and council will hire the project manager on the understanding that he or she prepares or directly supervises the preparation of the documentation involved in the hiring of consultants.

Requests for proposals are sent to selected consultants who will submit their proposals by the date specified. Before submitting a proposal, most consultants will visit the site, obtain technical information on the conditions and, perhaps, seek clarification on certain points from the project

manager. The project manager should be as co-operative and accommodating as possible. However, the project manager should be careful to treat all consultants fairly and not favour or give an unfair advantage to one. Important information which comes to light between the time the proposal request goes out and the date the proposals are submitted should be communicated to all the consultants by a notice or addendum to the proposal request. Consultants compete for business, and clients will get the best service and price if a fair basis of competition is strictly maintained.

Once the interested consultants have submitted their proposals, the important step of picking the successful firm with which a contract will be arranged must be carried out. Appendices 3, 4 and 5 of CN2 describes a process which can be used to decide which of the proposals is the best. As well, Appendix 3 provides information on how the consultant's fee will be set. While the consultant should be selected on the basis of best value for money, these firms normally follow provincial fee structures set by their association. The project manager, project team, band chief, and council must all be confident that the consultant can do the job. A good rapport and understanding must exist, so fees are only one of many important considerations. That is why the terms of reference in the proposal request and the selection criteria used to choose the consultant are so important.

Once the consultant contract is signed, work begins on the design. Normally, the design consists of a set of drawings and specifications. The design may, however, involve more than drawings and specifications. This will be discussed under Consultant Services, later in this part.

4.3 Design Preparation and Review

Early in design preparation, it is normal for the various consultant specialists (e.g. architect, mechanical engineer, electrical engineer) to visit the site and obtain the information and technical data required to do their work. The project manager, within the terms of the contract and what is otherwise reasonable, should co-operate with the consultant's personnel and ensure that they receive all the information needed. The consultant will likely have other questions as the work progresses. The project manager, in conjunction with the appropriate member of the project team, will deal with any items which arise. Questions or options on matters which affect the level of service or project objectives should be dealt with on a more formal basis. The reviews carried out at the 30%, 60% and 90% completion stages provide a good opportunity to do this. (Note: while this manual refers to 30%, 60% and 90% review stages, the reader should keep in mind that those formal design reviews can be referred to in different ways -- conceptual design, preliminary drawings, and final design is another common way to break down the overall design process).

4.3.1 The 30% Review

After the consultant begins work, the first important decision point for the project manager, project team, building committee, band chief, and council is the 30% review. Being 30% completed does not have a precise definition, as each design is different and each consultant likes to organize the work slightly differently. However, for a building design at the 30% stage, one would expect the floor plans to be prepared and the remainder of the building and its

systems to be sketched out. As well, the consultant will have decided on how the rest of the design will be prepared and any special systems or arrangements which are needed. For a water or sewer project, the anticipated population and expected flows would be confirmed or calculated. Sketches of the pipe size and location will have been done. Treatment systems will have been selected and outlined. The consultant has probably not completed much detail work, but the concept of what will be done is complete. The other important thing that the consultant must have done is to prepare a level two estimate. (Note: Referred to in the Federal Government as a Class "B" estimate).

The "level two" estimate is based on a detailed analysis of the materials, work layout and construction procedures which will go into the project. It will be more accurate than a "level three" estimate because it is prepared by specialists and based on more detailed information and analysis. The "level two" estimate is important to the project manager as it is the first confirmation from an independent source (i.e. the consultant) that the project will achieve its cost objective.

As well as cost, the quality and time objectives will be reviewed at the 30% stage. Depending on the results of the review, it may be necessary to make adjustments to the objectives. The amount or type of work (i.e. quality objective) may have to be changed to fit the money available (i.e. cost objective). More money may have to be spent to keep the project on schedule (i.e. time objective) or some other similar adjustments (e.g. adjusting the quality downward to meet the cash) may be necessary. The goal here is to ensure that the objectives are all realistic and attainable. If it is necessary, because of some previous oversight or mistake, to go back and seek reapproval of scope or financing, then this must be done. The project manager is not doing her or his job if the project is allowed to proceed without settling outstanding issues concerning the time, cost and quality objectives.

In addition, projects involving large Federal Government financial input will require "effective approval" at this point. This process usually involves a person or persons (e.g. project officer or program director) from the department preparing the submission. This person is usually a member of the project team which helps the process go smoothly. The project manager must be aware of what is going on and co-operate as fully as possible. It is important that sufficient time is allowed for preliminary approval when the schedule is prepared because this process can be slow, particularly if there are any questions or uncertainties involving the project.

As the design becomes more and more advanced (i.e. it goes from the 30% to the 60% to the 90% and final stages of completion) it becomes increasingly more expensive to make changes since the consultant will want additional time and money to make any changes to design work that is already completed. Therefore, when the design is reviewed at the 30% stage, it is the last chance to make changes that are relatively inexpensive. The project manager must impress this point on the project team, the building committee, and the chief and council, so sufficient time and effort will go into completing a thorough review. The consultant expects minor changes and direction on detail at this point. The project manager should ensure that the review work is well co-coordinated and the necessary decisions are made quickly so the design schedule is maintained.

It is normal for the consultant to request a progress payment at the 30% review stage. Details on terms of payment will be included in the contract. It is normal procedure to pay the consultant for the work that is done, less a 10% hold back (e.g. at the first review, the consultant would get 30% of the contract price less a 10% hold back).

Between the 30% and 60% review stages, the project manager can expect less contact with the consultant than in the earlier part of the design. This is because the consultant knows what the client wants and most of the major design decisions have been made.

4.3.2 The 60% Review

As in the 30% stage, the amount of work completed at the 60% stage can be described only in a general way. In the case of a building, one could expect most of the basic architectural work (e.g. what the building will look like and its layout) to be done. The mechanical and electrical systems (e.g. heating, ventilation, power requirements, lighting) will be sketched out. For a water or sewer system, one might expect to see the lengths and sizes of pipes, locations of manholes, sizes and capacity of treatment plants and a rough copy of the specifications.

The same type of major review should be carried out at the 60% stage. The project's objectives should be reconfirmed. The consultant may have questions or ask for preferences on options (e.g. types or colours of some materials, positioning of power services) which are available. Some changes can be made, but the design is now getting to the point where it must be finalized. Any "changes of mind" will cost money. However, if changes must be made, it is cheaper now than later on. The project manager must provide good leadership throughout this review process. The necessary briefings and meetings must be arranged with the proper people so good decisions can be made quickly.

4.3.3 The 90% Review

At the 90% review stage, all the design with the exception of final details will be complete. Any outstanding issues concerning the design must be brought to a conclusion at this point.

An important part of the 90% review is the completion of a level one estimate. (Note: Known as an "A" Class estimate in the Federal Government). A "level one" estimate is based on actual completed details (e.g. the quantities, grades, and costs of material needed; labour requirements and wages; profit and overhead; and other costs). The project manager uses the level one estimate as the basis upon which construction tenders will be called.

Again, at the 90% stage, it is important for the project manager to ensure the project objectives are attainable. If any adjustments (e.g. reducing the scope of work to keep on budget) are needed, now is the time to do it, before large amounts of money are committed in the construction phase. However, if a good job has been done to this point, and everyone has been kept involved, few changes should be necessary at the 90% review.

Once the 90% review is completed, the consultant will finish the design. This work involves completing the final details, preparing the final copies of the various documents (e.g. specifications and drawings), making copies, and, in general, carrying out the final checks. The project manager should expect to receive from the consultant completed documents which are ready to be used in the construction phase (e.g. to be used as part of the tender documents for letting the contract or the detailed technical direction for doing the work as a day labour project).

4.4 Consulting Services

Up to this point it has been assumed that the consultant's design has involved the production of a set of drawings and specifications plus level two and one estimates. When the construction phase is to be carried out by contract, the drawings, specifications, and estimates are the only documents normally required. However, the construction phase can be carried out by day labour or a combination of day labour and contract. This last method (i.e. a combination of contract and day labour) is quite common.

When the construction phase is to be implemented by day labour rather than contract, the design must contain the same basic information, but it may require a different presentation. The project manager may specify in the consultant's terms of reference what is required, or it may be left up to the consultant to specify in the proposal how preparing a design for implementation by day labour will be handled. The project manager should examine how the consultant proposes to handle this when assessing the consultant proposals.

In a day labour design, it is usual for drawings, a bill of materials, a day labour plan, and a work schedule to be prepared. In many cases, the consultant may combine the day labour plan and schedule in one document. It is important that the project manager ensures that all the needed information is available for the construction crews and that it is presented in a clear and easy to understand manner.

The drawings for a day labour project will be quite similar to those prepared for a contract. However, because a contractor is told what the product is to be rather than how to do the work, the drawings for a day labour project should contain more notes and detail.

Normally, a set of specifications is not prepared for a day labour project, as the information is included in the other documents. However, the project manager, with advice from the consultant, should decide what to do in each particular case.

A bill of materials is a detailed list of the materials needed to carry out the work. It can be compared to a shopping list. The bill of materials should describe the exact items required by catalogue number, size, grade or other commonly identifiable information; how much of the item is needed; and the total cost. Materials in the right quality and quantity can be ordered directly from a bill of materials.

When the project manager knows that the day labour crew will not be very experienced, the consultant may be directed to prepare a detailed day labour plan. This plan will detail how the

project is to be organized and carried out, how many workers will be required and the skills of each, how supervision and control should be exercised, and what tools or equipment will be needed. The day labour plan will usually be directly cross referenced to, or form part of, the bill of materials and schedule.

The schedule will give direction with regard to time. When the various items of work should be done will be detailed. A remote location, wet or cold climate, low worker productivity, and time required to obtain approvals should all be accommodated in the schedule. As noted earlier, if a schedule is not realistic, it is of little value. Note: This schedule can be regarded as a more detailed and updated version of the schedule prepared by the project manager in the planning phase.

For either a contract or day labour project, the project manager may make provision in the consultant's terms of reference for periodic inspection or full supervision during the construction. This subject will be discussed in the next part which deals with the construction phase. In addition, the consultant may also be required to put the documentation together and supervise the awarding of the contract for the construction phase.

Part 5: Construction Phase

5.1 General

The construction phase is the glamorous part of the project, the one most people think about when a project is discussed. While there is a considerable amount of work for the project manager in this phase, it will be relatively straightforward if the initiation, planning, and design phases have been carried out properly. During construction, the project manager ensures that everything that is supposed to happen to achieve the project's objectives is, in fact, taking place.

There are four common ways to carry out or implement the construction phase:

1. by day labour;
2. by contract;
3. by a combination of day labour and contract; and
4. by joint venture.

Since the work will proceed differently for each implementation method, this part will consider each, separately. Before this is done, the relative merits of each and some of the factors a project manager can consider when deciding what implementation method to use, will be presented. Note: While this information is being given in the part which deals with construction, it is important that the decision on the implementation method (i.e. contract or day labour) be made when the implementation plan is prepared. It is also possible that the chief and council would have specified the implementation method to be used as one of the conditions of the project.

5.2 Joint Ventures

Before considering the more common means of implementing capital construction projects (e.g. contract and day labour) a brief description of joint ventures is provided in the following two paragraphs.

Joint ventures may also be known by such names as consortiums or partnerships. These are arrangements in which two or more organizations (e.g. two private companies, a band and a private company, an aboriginal company and a private company, etc.) form a business arrangement in which they act as a single business entity. Within this arrangement, the parties involved agree on how they will act as one organization to achieve a common objective (e.g. undertake a project). These types of business arrangements can combine the strengths and resources of each partner. For example a band or aboriginal business may have ready access to labour, local materials or equipment, local knowledge, while a private business may have the work experience, special equipment, or specialized staff. Joint ventures can have benefits involving the advantages of both day labour project and contracts featuring good economic development and spin offs for the community. There are also potential pit falls. Good legal advice and a well written agreement for when and if things go wrong is

a must. A joint venture requires two partners who are comfortable working together. It must also involve an opportunity for both to share in the potential risks and profits (e.g. a situation where one party provides the capital and takes all the risk is not a wise business arrangement or true join venture).

A project manager involved in a joint venture should ensure agreements are in place that do not allow the business interests of the joint venture to over ride the community interests or the time, cost, and quality objectives of the project itself.

5.3 Contract, Day Labour or Combination ?

A decision must be reached on how the construction phase will be carried out: will it be by contract, day labour, or a combination? Following are some of the more common advantages of each approach. (Note: What is regarded as an advantage for one can be looked upon as a disadvantage for the other). Regardless of which implementation method or combination is chosen, the project manager must remember that good project management practices require achievement of the project objectives.

During the construction phase implementation by day labour could provide the following advantages:

1. A day labour project can increase local employment and keep more resources in the community.

2. Local materials can be bought and used to a greater extent. Like hiring day labour, this will stimulate the local economy.

3. Training programs can be set up to increase the various skill levels of community members as a part of the project objectives.

4. Essential changes that arise during the construction phase can normally be arranged at a better price since there is no signed contract.
5. Skilled, industrious, and well motivated day labourers with a sense of community spirit and involvement may carry out the work cheaper and better.

6. In remote locations, local day labour may be cheaper than contractors who must temporarily relocate in the area.

7. When there is an abundance of project work, contractors normally charge higher prices, which could make implementation by day labour cheaper.

8. Locally constructed projects develop a community pride of ownership.

Among the advantages of using contract, the following can be included:

1. Contractors are usually experienced in doing the work, therefore, they can be expected,

overall, to have better equipment, skills and knowledge than day labourers. This is particularly so when fully qualified day labourers are not available.

2. Contractors must deal with the difficult personnel, technical and material problems which frequently arise on a project.

3. Contractors are in a business which is motivated by competition and the need for ongoing profits. Therefore, their productivity may be considerably higher than day labourers and they, consequently, can do the work at a better price.

4. Contracts which include clauses referring to use of local resources (e.g. people, equipment, materials) are becoming popular. These incorporate some of the advantages of doing the work by day labour.

Utilizing a combination of contract and day labour for construction can result in some of the advantages of both implementation methods; however, there are some disadvantages to be considered:

1. Using two implementation methods means the two systems have to be set up which can increase costs (e.g. contractors normally have standard expenses for moving in equipment, paying supervisory staff and other fixed costs). Subtracting portions of the work for execution by day labour may result in the contractors submitting proportionately higher bids on the work they do. At the same time, day labour overhead costs must also be absorbed.

2. Using day labour and contract at the same time can create some co-ordination problems for the project manager (e.g. contractors may not accept work done by others or alternatively they may demand compensation for any delays when their progress depends on or can be delayed by others).

5.4 Day Labour

5.4.1 Choosing Day Labour

The project manager must be well prepared at the start of a construction phase which is to be carried out by day labour. It is essential that everything has been thought about, planned, and is ready to go.

The first part of this section presents the common items which make up the overall day labour plan. In most cases, this will involve a review or elaboration of what has been said in earlier parts of this manual. After the day labour plan has been discussed, a look will be taken at resources (e.g. money, people and material) as they relate to a day labour project. This will be followed by a discussion on the kind of organizational structures and procedures the project manager should ensure are in place. The last part of this section will deal with control procedures (e.g. how does the project manager make sure what is supposed to be happening is in fact taking place; how does he or she know the objectives are being achieved).

The day labour plan is the term used to refer to the drawings, cost estimates, cash plan, bills of material, schedules and specifications which, in total, specifies (i.e. plans) what must take place during the construction phase. Each of these items will be discussed in turn. In some cases, the consultant may supplement these documents with a written course of action to follow. Also, while each item is discussed as a separate document, the information may in some cases be combined. It is important that the information be clear and presented in a manner which can be understood by those who have to use it.

5.4.2 Drawings

The drawings (sometimes referred to as blueprints) will be the main source of direction to the construction manager and trade supervisors. It is important that these persons understand them. Several steps can be taken to achieve this. First of all, the construction manager should be made a member of the project team during the design phase. This will make him or her generally familiar with the project, the drawings, and the reasons for doing certain things. Each supervisor should be given a set of drawings, or at least all the sheets which apply to their part of the work, plus sufficient time to study them carefully. The project manager might consider making the design consultant available on a periodic basis to answer questions and ensure that the drawings are being interpreted properly. This can be done by making the necessary provisions in the original design contract or arranging a separate contract.

It is normal practice to have one set of drawings always available on the construction site so anyone interested can refer to them. A second set of drawings is used to draw or sketch in changes to the plan that occur during the actual construction. These drawings are called marked up drawings, and it is important that they be prepared as the work progresses. Marked up drawings will be discussed in the next part.

5.4.3 Specifications

The project manager may not require a separate specification with day labour or straightforward projects where the drawings can clearly indicate what is required, or where there is not a wide range of different material types and construction procedures. A specification is required, however, where it is important that the types of material and how they are used, be clear. A roofing felt of a specified weight, material which must be heated within certain temperature limits before use, a specified type of paint which cannot be applied on wood containing over a specified amount of moisture, concrete of a specified mix which must have a specified slump, etc., are examples of the types of things which could be covered in a specification.

It is common practice, when preparing a specification, to refer to existing standards which have been set. For example, electrical materials and work will refer to the CEA Code (Canadian Electrical Association Code), building structures may refer to various parts of the NBC (National Building Code), materials used to make concrete or build roads may refer to ASTM (American Society for Testing Materials) standards or CSA (Canadian Standards Association).

The project manager must keep in mind that specifications are a key element in fulfilling the quality objective. Failure to conform to specifications may result in shoddy construction, failure to provide the community with what they are paying for, and dangerous facilities which may require early and expensive repair.

5.4.4 Cost Estimates, Cash Plan and Bills of Material

There is no doubt that controlling cost is one of the key objectives in project management, and the project manager is particularly interested in this area. As was seen in the part on the design phase, the consultant is asked to produce a "level one" estimate for the project. The final "bottom line" figure for the complete job is very useful (particularly for the chief and council or others who are financing the project); however, the project manager needs this information broken down in more practical terms -- terms that can be used to manage the project. The two common ways to present cost information so it will be more useful are as cost estimates and cash plans. Bills of material contain important cost information and they can also be included.

Cost Estimates: Cost estimates are simple breakdowns of the total cost of the project into its major components. This provides information on not only what the main parts of the project are, but also, how much each will cost. An example of a "level two" cost estimate for a school project is shown in Appendix D. The cost estimate could have more or less detail than that show, but this example is fairly typical.
The cost estimate breakdown tells the project manager where the big expenses occur. This is useful for explaining and justifying the overall project. This information also tells the project manager and project team where to look if it becomes necessary to cut costs.

Those who approve and fund projects normally do so on the basis of the cost estimate. Although they may request additional information, they will probably be most interested in how complete and realistic the estimate is. (Note: It costs much less to produce a "level four" than a "level one" estimate; however, the information is put to a much different use. It is important to use the degree of accuracy and detail in producing a cost estimate that fits the requirement).

Cash Plans: Cash plans, commonly called cash flow plans, are another way of managing the cost objective. As was noted earlier, projects involve very large amounts of money and the project manager may not have access to the funds until the time (e.g. year and month) when the actual expenditure will be made.

The cash plan is a month by month forecast of cash requirements. The cash plan is closely related to the work schedule which will be discussed later in this part. The cash plan represents the progress of the project in terms of its cost objective, and the schedule represents progress in terms of the time objective. It is normal for the person who prepares the schedule and estimate to also prepare the cash plan.

An example of a cash plan is shown in Appendix E. (Note: The cash plan is for fiscal year 1996/97 which is the period of greatest cash requirement for the school project referred to in Appendix D).

Bill of Materials: A bill of materials shows the exact quantities of different material needed and the estimated costs. The bill of materials is sometimes prepared with the material specification included (e.g. a catalogue number, the grade of a product, a specification number, a model number). This quality control type of information is normally included in the bill of materials when a separate specification is not prepared.

The main function of the bill of materials is to provide a list from which the proper materials in the correct quantities can be ordered. It can also be used to check quantities received on the project site. It is unlikely the construction manager or supervisors will want to receive all the material at the same time, so the bill of materials can be useful to the store person who is keeping track of what is to be ordered, what has come in, and what is used.

The cost estimate for the project may state one lump sum for the material. The bill of materials break this lump sum down into specific detail.

5.4.5 Schedules

The schedule is one of the most important documents that the project manager will maintain. Extra information can be added to the schedule, but essentially, it is a list of all the activities which shows when each must start and how much time is allowed for it.

One of the simplest schedules is an activity list which states all the activities that must happen in their proper order, and the time allowed for each. The activity list is good for the simpler jobs where different things do not happen at the same time. It is easy to understand and prepare an activity list once the information is available. See Appendix F for an example.

Once the project becomes a bit more complex a bar chart can be used. An example of a simple bar chart is shown in Appendix G. It may include additional information such as the percentage of the overall work completed, the percentage of the total budget represented by each activity,

and the amount or percentage of the budget expended. (Note: While the project manager can add a great deal of information to the bar chart, it should not be so complex that it is difficult for someone else to understand. The purpose is to give clear information, not confuse.)

Perhaps the most important function of a schedule is to force the consultant or project manager who prepares it to communicate with all the people involved and think the process through. Each part of the project must be considered: the material suppliers, the construction supervisor, project managers from other projects who must be consulted; the best time to do various types of work (e.g. construction starts in the spring, need to move materials on winter roads); the supply of available skilled labour; and time required to approve important paperwork. Preparing a schedule is a difficult procedure. It raises a continuing series of questions which require answers. However, this is the important process by which the project becomes understood. If problem areas are foreseen then the project manager can take steps to eliminate or deal with them.

Once the schedule is prepared, it can be used by the project manager to measure the project's time performance. The work done will either be on, ahead of, or behind schedule. What is actually happening can be shown on a copy of the planning bar chart. This gives a good comparison of planned work versus actual. For a well prepared schedule and well managed project, one can expect some work to go quicker than planned and some slower but the project itself will be kept on schedule overall.

A project manager can use a schedule as a means of communication. It is difficult to find a clearer method of quickly showing an interested group (e.g. chief and council, building committee, visiting officials, construction supervisor) the planned progress and comparing it to what is actually happening. The project manager's verbal explanation is supported by a visual presentation (i.e. the bar chart) which ties the parts of the project together. The audience understands the situation better, problems are easier to explain and attention is kept focused on the objectives.

Other methods of scheduling such as PERT (Program Evaluation and Review Technique) diagrams and arrow diagrams can be used. These different methods of scheduling use symbols to represent activities, times and delays. Activities which cannot take place until others are finished and key activities which collectively control the project (called the critical path) can be shown. These techniques require a short course or self-study if used by the project manager. A bar chart will provide good control for the typical type of construction found in a community of less than 1,000 persons, and the more complex scheduling techniques are not required.

There are also scheduling systems (e.g. software programs) which can be used with a personal computer. These programs produce clear and professional looking work, however, they need the same reliable information put into them.

5.4.6 Accounting

Earlier in this TID, the project manager's responsibility to obtain financial approvals, monitor the preparation and approval of cost estimates, and prepare a cash plan were presented. These things are done to ensure that the money to pay the costs of the project is available.

Money must be controlled. The project manager must know the total budget, the cash flow, how much is spent, and how much is committed (e.g. owing on unpaid bills, wages, contracts). As well, the project manager must know the activities which require future funding. Managing the money aspects of a project is not too much different than managing one's own personal finances.

Two methods for controlling funds will be discussed. In the first method, the band office provides accounting services to the project manager. In the second, the project manager sets up an independent procedure for controlling project funds. In both cases, the objective is the same -- to provide an information system which enables the project manager to know what is going on financially.

Using the band office to provide accounting services is perhaps the most common and desirable means of controlling cash and paying the bills. Managing money requires accounting skills and expertise much the same as any specialized activity. If these services are available from the band office, then the cost for providing them should be lower and, in addition, the project manager has a good source of advice and expertise.

Because the accounting (e.g. keeping ledgers, checking invoices from suppliers and contractors, preparing the payroll, dealing with tax issues and the bank, etc.) for a large capital project will involve a considerable workload, the band office may not have the personnel to assume those additional duties along with their normal work. In such cases, the project manager may be able to work out an agreement with the band manager by which the project will pay for additional staff and in return, the band manager will provide the project with accounting services. This cost, like all other costs, should be included in the project estimate.

There are advantages to using the band office; however, the project manager must ensure that the necessary cost information is supplied accurately and at the times or dates agreed to. The project funds plus the charges and commitments against those funds should always be identifiable. The project manager should clarify and agree on these matters with the band manager during the planning phase of the project so the required financial information will be available when needed.

There will be situations where the project manager must set up an independent accounting system. In such cases, the project manager should treat the situation the same as other tasks which have to be done. The work should be identified and a competent person put in charge and given the resources to set up and carry out the job. Many projects encounter serious problems because those in charge fail to carefully record and keep track of the money and costs.

There are special techniques such as double entry bookkeeping which are used by accountants. Unless the project manager has the expertise readily available, the procedure may be kept simpler for a single project. This should not be interpreted to mean that it does not require a

considerable amount of careful work. Appendix H contains a basic system which can be used by a project manager who does not have regular accounting services available. It uses a single entry format which takes the total budget and breaks it down into as many sub areas or activities as the project manager wishes to control separately. The project manager can, for example, keep a separate account on monies spent on planning, design, contracts, material, labour and overhead. Each of these activities can be further broken down into sub-activities (e.g. contracts could be subdivided among the different contractors, labour could be subdivided among different trades, etc.). This gives the project manager financial control over the entire project. Bank balances and the cash flow plan are kept separate from this accounting system. Each provides a good cross check on the other and all must balance.

5.4.7 Staff

People are usually the most difficult resource to manage. Because of their varying skills, attitudes, experience, and work habits, people require very careful attention. Much depends on the leadership abilities of the project manager and supervisors. Leadership in this sense means those qualities persons have which enable them to influence the behaviour of others. The chief and council or the building committee should carefully consider leadership ability when the project manager is hired.

The project manager must establish the types and numbers of skilled people required throughout the construction. Good advice in this area is important. The consultant who prepares the design can be requested, as part of the contract, to prepare a labour plan for the project. This plan lays out the numbers and skills of the people required throughout the construction phase. It must be prepared in light of the actual conditions which exist on the project. As well, the project manager should, if possible, allow the supervisors to participate in the selection of their subordinates. Project managers and construction managers who have experience on similar jobs are an excellent source of information on the kinds of people required and when they are needed.

The project manager should bear in mind that constant hiring and layoffs can lead to poor morale, and workers who are unfamiliar with the project and the working conditions. Workers, as well as supervisors, want to know the basic employment situation (e.g. rates of pay, safety rules, discipline policies, qualifications needed for the different jobs, how long the employment will last, etc.). A good project manager is one who can put together and maintain a team which shares common goals. The project manager should not strive to be popular, but rather consistent, fair, willing to listen, and decisive.

Keeping accurate and up-to-date statistics on each worker is essential. To do this, it is necessary to keep a personal statistics record on each person. This gives all the personal data such as name, address, next of kin, and social insurance number on an individual, which will be needed for records or some unforeseen circumstance (e.g. the person must be contacted after the project is finished, an accident occurs, etc.). In addition, a pay card should be maintained for each individual. The pay card is used daily to record the number of hours worked at a particular pay rate, overtime, and any other related information. Frequent questions arise about

pay and deductions. Unless the records are available to support what has been done or to correct mistakes, arguments and poor worker morale can result.

Keeping staff records or cards lend themselves to easy computer application.

5.4.8 Supervisors

There are a number of things the project manager can do to ensure that the people are well managed. First and perhaps most important, the project manager must have the necessary and appropriate supervisors -- qualified, competent people in charge of each major activity. For example, on a large project, the project manager could have a construction manager in charge of the overall construction with supervisors responsible to the construction manager for each specialized area (e.g. structural, electrical, plumbing supervisors; an accountant; store person, etc.).

Hiring the construction manager and other supervisors requires a careful assessment of what authorities and responsibilities these people should have. The project manager must keep in mind any community related policies the chief and council have in place, and the time, cost and quality objectives for the project itself. Within this framework, the project manager must delegate responsibilities and authorities, keeping in mind that the quicker a decision can be made, the less it will cost in terms of time and money. Supervisors should be hired for their judgement, what they know about a particular area, and their ability to get others to do a good job.

The construction manager and supervisors should have a written and signed job description similar to the one recommended for the project manager in Part 2.0. The time to resolve conflicts is before they happen. Such things as policies and financial authorities (e.g. who can authorize expenditures, and to what dollar value, overtime, hiring and firing, discipline, safety, late arrival) should all be clear at the outset. The project manager should endeavour to minimize regulations, but enforce those that do exist firmly and fairly.

When delegating responsibility to the supervisors, the project manager should be guided by the general principle that the more authority one has to do the job, the easier it will be to make decisions and act quickly. However, the project manager must balance this with the practical realities of experience, competence, judgement, and decisiveness of the individual; community policies, whether or not a quick decision making process should be put in place and whether it is possible to make clear distinctions between decisions the supervisors and other persons should make.

Standards must be set for supervisors as well as workers (e.g. What experience is required for each job? What education? What training qualifications? Will a supervisor be able to motivate or handle the difficult situations which can arise when persons from the same small community or relatives must be disciplined?). Supervisors are the principal means the project manager has to reach the time, cost, and quality objectives. The project manager must be satisfied that each supervisor can produce results satisfactorily.

5.4.9 Material

The material required on a day labour project is usually ordered from a bill of materials prepared by the consultant. Supervisors responsible for specific areas of the construction should be given the opportunity to review the bill of materials before any orders are placed. Any major conflicts between materials wanted by the supervisors and those specified by the consultant should be resolved. Supervisors in some cases may be called upon to prepare their own bills of material using the drawings and specifications.

As well as bills of material, the specifications, if prepared, may contain information on the types of material required.

Sources of supply for the required material must be considered. Potential suppliers must be considered in terms of what prices they can offer. Along with questions on prices and discounts for bulk purchases, there are a number of other important considerations regarding the suppliers such as the quality of their products, whether they keep sufficient stock levels, whether they deliver, and what their after sale services are like.

Material supply in rural or remote areas should be very carefully co-ordinated. In some locations, materials may have to be delivered by air, barge, or winter roads, and therefore, planning up to a year in advance may be necessary. Not only must the project manager ensure that all the needed materials are properly ordered the first time, but the required items must be available when the weather is favourable, the workers are on site, etc.

During periods when there is a great deal of construction activity, shortages of particular kinds of material may occur. Some pieces of equipment (e.g. electrical transformers, mechanical air handling equipment) may have to be manufactured or custom made, or the items may involve long delivery periods. The best way to deal with problems of this nature is to ensure that there is well co-coordinated long range planning. The project manager must find out if there are potential delivery problems and plan accordingly.

Materials must be stored and controlled on site. This can involve some cost and planning. Examples of common materials that require special attention include plaster board and carpeting which must be stored in a dry location. Materials such as roofing felts must be stored on end, paint cannot be allowed to freeze, and inflammable materials must be stored in segregated fire proof containers.

As well as special storage conditions which may be required, the threat of theft or vandalism must be considered. Preventive measures include a simple lock up, extra lighting, extra surveillance requested from the police, or the employment of security guards. Security can be expensive so the project manager should ensure that associated costs are identified in the original project estimates.

The project manager may be able to arrange for receipt of materials as they are needed. This is often the only practical procedure for such things as ready mix concrete or asphalt. For other

materials, it will eliminate at least some of the costs of providing storage and security.

Material must not only be received on time and kept secure but it must be controlled. This involves knowing what material has been ordered, received, used, and what materials are still needed. On any, but the smaller projects, a store person is required. This position is often combined with other duties.

As with decisions on materials, the project manager must decide what tools or special equipment will be needed. It is often the policy that workers provide their own personal or hand tools (e.g. hammers, saws, pliers). Special tools or equipment (e.g. shovels, extension cords, wheelbarrows, staging) are normally supplied by the employer. These can usually be provided by borrowing, renting, or, if necessary, buying. The project manager must ensure that control is provided by the store person so the equipment is safe to work with and not lost or stolen.

The project manager must consider the method for handling certain types of material. When large or heavy loads are involved, the rental of some specialized equipment such as fork lifts or cranes must be considered. Alternatively, when such equipment is available, materials should be ordered to take advantage of it (e.g. delivery on pallets if a fork lift is available).

5.4.10 Support Services

When a capital construction project is being considered, major items like money, material, skilled trades people, specifications, drawings, heavy equipment, and contractors immediately come to mind. However, there are a number of other items which are just as essential to the project manager. A number of these activities (e.g. accounting, material handling) have already been discussed but other support services are also of concern. General office services such as typing, filing, and looking after mail must be provided.

Project managers should keep in mind that people in construction are often prone to discount the importance of keeping "paperwork" up to date. Such a situation can lead to the project manager and supervisors not having reliable information upon which to make decisions. Too much time can be spent looking for information or resolving the problems and delays which occur when control is poor.

The project manager must give careful consideration to how support functions will be provided. While it is essential that the work be carried out, it must be done efficiently since surplus or unproductive staff will increase costs. Some duties may be carried out by the band office personnel, particularly on smaller projects. On large projects, the support staff could consist of a support services supervisor with two other persons, one to do the accounting and personnel control and one to do material control. A flexible staff who are capable of carrying out a number of different functions and initiating action on their own is required. The project manager should ensure that the supervisor has a job description which details that person's responsibilities.

5.4.11 Safety

The project manager must make provisions for safety. Safety on all projects is important, but it is critical on day labour projects where some workers may lack experience or previous exposure to construction conditions. In today's society industrial safety is increasingly important to the work force. Individuals and their unions are insisting that employers provide adequate protection for the safety of workers.

Safety can involve such different things as ensuring that at least, one person with up-to-date first aid training (e.g. St. John's Ambulance) is always available on the job site; teaching employees proper work techniques (e.g. lifting); ensuring that procedures are established and equipment is available for trenching and erecting scaffolding; fire protection procedures are in force; personal protective equipment and clothing is available; accident reporting and safety committees are established; traffic control is maintained; adequate insurance is obtained; house keeping procedures are in place; electrical and heavy equipment hazards are identified; and correct procedures involving hazardous activities such as concrete placing, framework, and roofing are established.

The project manager can obtain assistance or advice on safety from a number of areas. First of all, supervisors should be selected partly on the basis that they are knowledgeable about safety, have a safety minded attitude, and are capable of implementing the necessary safety measures in their area of responsibility. There are, in a number of provinces, industrial and government sponsored organizations which promote construction safety. Various types of information, literature, and training are usually available, often at little or no cost, from such organizations. Examples of organizations where help may be obtained include the Workers Compensation Board, St. John's Ambulance, Red Cross, fire departments, and construction associations. Manufacturers are also often prepared to teach people how to use their products correctly and safely.

5.4.12 Training

It is an increasingly common practice for First Nation communities to use capital construction projects as a training vehicle to improve the technological and managerial skills of the community members. Training programs that are now being used range from projects which are organized and co-sponsored by a training establishment such as a community college down to individual apprenticeship programs.

The project manager who is directed to set up a training program should obtain the details on what the chief and council want. When the requirement is understood, the project manager should seek advice on what sort of program would be appropriate and possible. Trade schools and community colleges, provincial organizations (e.g. ministries of Labour), Human Resources Development Canada (HRDC) and DIAND may be able to assist with and/or specify the requirements.

In addition to the technical training opportunities provided by a capital project, there are also opportunities to develop managerial and administrative skills. By having persons on training act as assistants or co-coordinators, they can learn to perform the functions for later projects.

The project manager must ensure that the cost of a training program is identified and approved in the project budget. Supervisors must ensure that the quality of work is maintained.

5.4.13 Control

The project manager must maintain time, cost, and quality control once the construction phase is in progress. All of the careful planning and work that went into preparation will be lost if the project manager does not make sure that activities laid out in the schedule, design and construction plan, budget, cash flow, etc., do in fact take place. The project manager's task is one of using planning and control tools to know what is going on.

Knowing what is happening in simple straightforward terms enables the project manager to take the necessary corrective measures and supply the required information to others (e.g. building committee or supervisors).

There are a number of ways the project manager can maintain control. Some of the more common are discussed below.

Meetings - Meetings are the usual way of keeping people informed. The project manager should have a weekly job meeting. The construction manager, the supervisors and other key people such as the contractor who are involved in day to day activity should attend. Each should outline their progress by indicating if they are on, ahead, or behind schedule; what problems they have; corrective action planned; and what work must be co-coordinated for future activities. As well as these weekly meetings, the project manager should ensure that the project team gets together on a regular basis. Unless something out of the ordinary arises, project team meetings on a monthly basis are suggested.

Band Council - Not only is it important for the project manager to receive the proper information from those working on the project, but care must be taken to ensure that the proper information is passed along to the building committee or chief and council. They should be given a copy of the monthly project report referred to below and be provided with a verbal briefing.

Reports - The project manager should also make use of reports. Reports have the advantage of being restricted to a statement of the facts and only one person is involved in the preparation. By requiring regular and factual reports, the project manager not only stays current, but forces supervisors to stay on top of their areas of activity.

If consultants have been hired to supervise all or a part of the project, it is usual for the project manager to require a monthly report. It is necessary to specify in the terms of reference and the contract exactly what information is required. The project manager wants to know in clear, simple language, the status of the time, cost, and quality objectives of the project.

It is usual for the project manager to collect information from the construction manager and supervisors on a weekly basis, and combine it with cost data and consultants reports at the end of each month to produce an overall monthly project status report.

The project manager should not lose sight of the basic principle that he or she is responsible for the total project. The ability to assess the key indicators (e.g. schedule, budget, work quality, morale and co-operation, ease of obtaining answers) of a project's progress is an important skill for a project manager to develop. Whether it involves project control or other items, the project manager should not get "bogged down" in detail which other people could and should look after. This is where delegation of responsibility and authority becomes important. If one concentrates all of one's time and interest in one area, the rest of the project can get badly out of control. Former tradespeople who are now project managers must avoid the common mistake of devoting too much time to the areas with which they are familiar and comfortable at the expense of the rest of the job.

5.5 Contracting

5.5.1 Contracting Generally

Contracting is the most common means of carrying out the construction phase of a project.

This section discusses and explains the steps which are commonly involved in carrying out the construction phase by contract. A discussion of the inspection and quality control procedures the project manager must take to control the contractor are included. CN1 Contract Administration Training Publication, CONSTRUCTION CONTRACTING GUIDELINES FOR FIRST NATIONS AND ABORIGINAL COMMUNITIES which is a contracting manual specifically written for the types and sizes of construction projects found in First Nation communities. (Note: This manual, which will be referred to as CN1, is a detailed guide that suggests appropriate procedures at different stages of the contracting process. It provides examples of the formal wording and forms which can be used).

A contract is a legal arrangement between two parties. Keeping good records and putting all agreements in writing is essential. The project manager will do well to remember that the contractor is in business to make money. The contractor should be regarded as a business associate and not a friend. Contractors normally respect those who know the details of the contract, work in a businesslike way and are prepared to seek fair solutions to problems. Some contractors will take advantage of persons who are poorly prepared or willing to accept personal favours.

Contract administration, like other areas in project management, requires study and experience to develop expertise. Unless the project manager is experienced in this speciality, the necessary assistance should be obtained from a competent contract administrator. Poorly managed contracts can easily lead to disputes involving legal action, high costs and a poor product. There are seldom any real winners in those situations.

5.5.2 The Contracting Process

Once the decision is made to carry out all or part of the construction by contract, a process similar to the following should be undertaken:

1. Contract documents are prepared which describe the work.

2. A tendering process is used whereby contractors submit bids for doing the work.

3. The lowest qualified tender is normally accepted and a contract is signed with that firm.

4. The contractor carries out the work and the project manager monitors it to ensure the terms and conditions of the contract are being met.

5. The contractor is paid in accordance with the terms of payment which usually provide for monthly payments based on physical progress.

6. The contract is completed.

5.5.3 The Contract Documents

This discussion on contract documents assumes an approach similar to that outlined in CN1. The number of forms and schedules involved often appears confusing. However, the project manager will find that each form or schedule has an important function and covers an important area and set of conditions. A project manager need not memorize all the information in the contract documents, but he or she must take the time to read everything through and know in a general way what is included. When this is done, the information pertaining to specific questions can be found quickly, and the project manager is aware of the contractor's obligations.

In Part 4.0 it was stated that the design consultant must be told exactly what is wanted. The same applies to a contractor. Everything must be clearly outlined and every aspect must be covered. The contractor must be told what to do, how payment will be made, the various ground rules which apply to the contract itself, what insurance the contractor must carry, the working conditions (e.g. pay scales, safety, etc.) which will be acceptable, and what guarantees (e.g. bonds, warranties) are needed. All these together make up the contract documents, or when agreed to and signed, the contract.

A considerable amount of information must go into a set of contract documents. Normally, they will contain specifications and drawings, tender instructions, tender forms, general conditions or articles of agreement, labour conditions, insurance schedules, contract security conditions, a contractor's qualification statement and terms of payment. Fortunately, much of the information is standardized so the project manager or contract administrator need only originate the changes which make the documents specific to the project.

The contractor will examine the contract documents, particularly the specifications and drawings, very carefully to determine the quickest and cheapest way to carry out the required work. Those bidding on a contract often have questions about various items. Therefore, the project manager should arrange to have the design consultant, an engineer or other person qualified to make the necessary judgements available to clarify or interpret a technical point. From time to time, a contractor will find a mistake or oversight in the drawings and specifications. When this happens, a formal addendum (i.e. a written notice containing the details of the correction) should go out to all those who are bidding before the tender closing date. If there is not enough time to advise the bidders, then the project manager should consider extending the tender closing date.
Following is information on specific parts of the contract documents.

The tender instructions set out the guidelines which will be used in the tendering process itself. It tells the contractor what must be done to submit a valid bid. It covers such things as how the contract will be amended, if necessary, the closing date for bids, and what information the contractor must supply.

The tender form provides a standard format which the contractor must follow when providing the necessary information such as the all important bid price. As well, the tender form will contain items of key information, supplied by the project manager, on such things as when work must be started and how long the contractor's bid will be valid.

The general conditions or articles of agreement are a list of definitions, responsibilities, terms and conditions which will apply after the contract is signed. This section contains the ground rules to cover all the situations which might arise.

Labour conditions are included in the contract documents to ensure that the contractor pays the workers the going rates of pay in the area. This gives the job a degree of stability and the project manager some assurance that the contractor will attract workers who are as well qualified as others employed in the area. Labour rates are easily obtained from the HRDC or provincial Ministry of Labour.

An insurance schedule is included to tell the contractor what types and minimum coverage of insurance the contractor must carry. The insurance provides protection for the contractor, the project, and the community during the construction phase.

The contract security conditions specify what securities (e.g. performance bond, security deposit, letter of credit) the contractor must provide. This security provides the project manager with assurance that the selected contractor will sign a contract and carry out the work.

The contractor's qualification statement gives information on the contractor, such as what type of business (e.g. corporation, partnership) it is, the volume of construction business handled each year and the qualifications of the staff. The project manager is entitled to know, and in fact, should be convinced before a contract is ever signed, that the contractor has the personnel, equipment, financing and experience to handle a project of the size and type being bid on.

Terms of payment will outline how the contractor is going to be paid. For example, will there be a single lump sum payment after all the work is successfully completed, will a unit price basis be used or will progress payments be made throughout the course of the work? If progress payments are to be part of the contract, the contractor must know how to request a payment, how the payment will be calculated, and what the holdbacks will be.

5.5.4 Tendering Process

Once the contract documents are completed, the tendering process begins. This is a procedure by which the contract documents are put into the hands of contractors who will be interested in preparing and submitting bids. There are two different methods used for doing this. The first is to invite bids from specific contractors and the second is to allow any interested contractor to bid (i.e. an open bid).
Invited Tenders - The project manager gives a set of contract documents to selected contractors, who are invited to submit a bid. This approach is usually used for small jobs, usually under $100,000.

In using the invitation method, at least three competent firms should be invited to bid. Competition is maintained because each contractor knows that other firms are involved. It is not uncommon for a contractor to make a mistake when preparing a bid and arrive at a price which is much too high or too low. Both cases mean trouble for the project manager. When the bid is too high, the client pays too much. When the bid is too low, the client is dealing with a contractor who soon realizes a mistake has been made, and is attempting, even before the job starts, to cut losses. Receiving a minimum of three bids offers some protection for the project manager because any single bid which is very different from the other two or far out of line with the project estimate can be questioned or disregarded.

Bids are invited for small jobs because the tendering process costs both the project manager and the contractor considerable money. Preparing and copying the documents, meeting with contractors, writing letters and studying bids take time for the project manager. The contractor must investigate each bid carefully, prepare a cost estimate, visit the site, and arrange for bid security. This all means expenses for the contractor with no guarantee any business will be obtained. For this reason, many contractors may not be interested in preparing a bid for a

relatively small job. However, when the contractors are invited to bid, they know competition is limited to some extent, and there is a reasonably good chance of obtaining the contract.

While a minimum of three invited bids is recommended for the reasons outlined in the previous paragraphs, it is not unusual for the project manager to limit the maximum number to five or six. This still keeps the administrative workload down and provides a good selection of bids.

Public Tenders - Public or open tendering is commonly used for projects over $100,000. Open tenders give any interested contractor the opportunity to bid on the job. This method of tendering ensures that the most competitive price is obtained.

The process used for public tenders is to advertise the existence of the project in the business section of newspapers. To ensure that a good selection of interested contractors will be aware of the project, the project manager will have to decide how broadly to advertise. This can range from several provinces for a large multi-million dollar contract down to the local newspaper for a smaller job. The project manager must keep in mind that all legitimate contractors should have the personnel, equipment, financial resources, and experience to match the size of the job.

The advertisement which the project manager places in the newspaper will tell contractors where (e.g. the band office) a set of contract documents can be picked up and what deposit must be made on them. This deposit should be required so only genuinely interested people will request a set. The project manager should arrange to keep a record of who picks up sets of contract documents. The deposits should be kept in a secure place as it is normal practice to return them after the tender closing date if the specifications and drawings are returned in good condition. As well, arrangements must be made for contractors to have access to the construction site to view the conditions.

The contract documents should contain all the needed information. However, there are often questions from the bidders. The project manager must exercise discretion in providing the answers. The best price will be obtained only if fair competition is maintained between bidders. Contractors will often attempt to obtain confidential information (e.g. how many firms are bidding, the client's estimate of cost, how good the project manager's inspection will be) which will give them an advantage in the competition. The project manager must maintain business ethics which are beyond reproach.

No matter how careful one is, errors in the specifications and drawings as well as the other contract documents do occur. If mistakes are discovered, the project manager should give each contractor who has taken out a set of contract documents, the same corrected information. This process is called "raising an addendum", and it is a rather routine procedure in the construction business. The addendum is nothing more than a formal notice which changes or explains some detail in the contract documents.

5.5.5 Contract Award

Once the tender opening date arrives the project manager must make arrangements to review all the bids and award a contract. Fairness and similar treatment for all the tendering contractors is a must. It is a good procedure to have the tenders opened in public and invite all contractors to attend. It should be made clear before opening takes place that the only information which will be made public immediately, is the bidders and bid prices. The reason for this is that each bid must be studied carefully. This is done by a tender award committee made up of such persons as the project manager, a member of the building committee, the band manager and a person knowledgeable about contracting procedure. This committee must ensure that each bid is complete, the contractor has not inserted any special conditions, the proper contracting security is indicated, etc. Any negotiation with the successful bidder must be done before the contract is awarded.

A community or project manager should not place themselves under an obligation to award a contract to the lowest bidder; however, to maintain their business credibility, a good and well substantiated reason (e.g. the low bidder has done poor work for the community in the past or lacks experienced personnel and/or equipment) must exist for turning down the low bid. If the low bidder asks why he or she was not chosen, the reason supported with facts should be supplied. There is, however, no need to debate the issue with the contractor.

It is not unusual for a band chief or band manager to want to approve the selection and award the contract. Other organizations who are making a financial contribution to the project may also wish a voice in this process. A great deal of money may be involved, and it is the project manager's responsibility to ensure those who have the authority to award a contract have all the facts and required information.

Once the successful contractor is chosen and the necessary approvals are obtained, a contract is signed. Basically, two signatures are necessary. These are the recognized authorities representing the contractor and the community.

The main reasons for hiring a contractor is because the firm has the expertise, the equipment, and the general know-how to meet the project objectives. A good project manager and contractor will build a relationship in which both parties know their responsibilities, respect the interests and obligations of the other, and co-operate to the fullest extent possible. The contractor knows the project manager must meet the project objectives. The project manager allows the contractor free access to the job site, and minimizes interruptions to getting on with the work and making a profit. The contractor should have good control over material, energy, insurance and other fixed costs. However, time is usually the critical element. Extra time means additional wages, equipment rental costs, loss of good weather and effort which could be devoted to another job. Causing delays or slowing down, the contractor unnecessarily, makes things difficult for everyone involved in the project.

A rather detailed set of conditions, contained in the general conditions of the contract documents, govern the relationship between the contractor and the project manager while the work is being done. In general, the site is turned over to the contractor. If it is necessary for the contractor to co-ordinate portions of the work with some other activity such as day labour, then those details must be included in the contract documents.

The project manager should ensure that careful control is kept on who can give direction to the contractor. The contractor should be advised at the first meeting on who represents the community. Usually, only the project manager or one alternative is authorized to give directions to the contractor. A contractor has a legitimate right for a contract extra for any work requested which is not in the original contract.

5.5.6 Inspection and Administration

The project manager has two main areas of concern while the contractor is carrying out the work. The first and most important is that it is being done properly from a technical point of view. The second is contract administration. Each of these areas will be discussed in turn.

Contract Inspection - The project manager must recognize that a contractor is responsible for supervising his or her own personnel, buying material, and solving all the day to day problems which arise. The project manager has only to ensure that the work is being done in accordance with the specifications and drawings. Inspection is a necessary part of the construction phase, but it is expensive. The project manager must ensure that good judgement is used to decide what inspection is necessary and choose the most efficient and effective way to carry it out. The type and amount depends on the nature of the job. The project manager should, if necessary, get advice on this matter. The design consultant is a possible source of information.

The project manager might be hired on the basis that he or she is qualified to do the inspection, and it is part of the job. A common practice is to arrange for the design consultant to do the inspection. As well, a different consultant who might specialize in this area could also be considered. Professional testing companies (e.g. for testing soils, concrete, welds), provincial authorities (e.g. for inspecting plumbing and electrical work), and utility companies (e.g. electrical suppliers, natural gas) can also play an important role in the inspection process. The project manager may also consider using locally available persons who have the necessary experience and qualifications to inspect certain types of contract work. General inspections which involve site tours and meetings made by members of the project team, the chief, the building committee or other responsible persons also play an important role in the overall quality control of the project.

An inspection usually concentrates on certain key activities. The grades of lumber; type of welds; soil preparation for underground pipe; the surface preparation and quality/type of paint; and the slump, air entrainment, and 28-day strength of concrete give measurable indications on whether or not the contractor is going the work properly. The scheduling of inspections is important. Certain types of work such as underground pipe installation; plumbing, wiring and

insulation in walls; roofing; and surface preparation for paint must be inspected when the work is still visible. Timing of inspections is critical.

The project manager must remember that only the work covered by the contract documents is being inspected. The contractor cannot be expected to do anything which is not specified. On the other hand, the contractor is obliged to do all the work in the contract in accordance with the specifications and drawings and must redo anything not done correctly. The project manager must not delay passing any information to the contractor, and co-coordinating the inspections with the progress of construction.

Progress Payments - The contract documents should specify how the contractor will receive progress payments during the course of the contract. Progress payments are important to the contractor because material, rentals, payrolls, and bank loans must all be paid. The normal procedure is to pay the contractor for the portion of the completed work plus any delivered materials on site, less a specified hold back. The hold back is usually 10%, but depending on the type of contract or if a labour and material bond are in place the hold back could be 5%.

The contract should require the contractor to provide a work breakdown before the work begins. This work breakdown is similar to a work schedule in that it separates the work into different elements, each identified by a cost which is a percentage of the total contract it represents gives the contractor and project manager a basis for arriving at the total work completed at any point of time.

The project manager must carefully review the work breakdown when it is submitted by the contractor to ensure that it is reasonable and factual. Contractors will often attempt to do what is known as "front load" or "unbalance" whereby the work done at the start of the job will be assigned a bigger percentage of the total cost than actually exists. In this way, the contractor gets more money earlier. This is a situation not in the best interests of the project manager. Some negotiation may be necessary to reach an agreement on the work breakdown and corresponding costs.

Projects need a system of measurement modified to suit the type of work being done (e.g. projects involving excavation or supply of material like concrete or aggregate can use weight or volume as the basis for progress payments). The important thing is that progress payments are based on information which can be verified and a fair portion of the total cost can be calculated. It is best to keep the calculations simple and straightforward. The basic information in a progress payment consists of the total work completed to date plus materials on site (expressed in dollars) less the hold back to date and less the total payment made on previous progress payments.

Extras - The basis of a contract, as noted earlier, is the work clearly identified in the drawings and specifications. Any work requested beyond that involves an extra.

An extra is arranged by describing the additional work required and the contractor and project

manager then agreeing on what the additional cost will be. Once this agreement is reached and the approving signatures are obtained a contract amendment is prepared, and the extra becomes a part of the contract.

The project manager may or may not be authorized to approve extras. This should be specified in the project manager's statement of duties. The building committee will often give the project manager authority to approve extras which are of an engineering or design nature, provided the cost is below a certain value and it can be covered by a contingency allowance. Any extras which involve an increase or decrease in the project scope is usually not approved by the project manager. Such work is normally approved by the same person(s) who approved the original contract. The project manager must have a clear understanding of the financial authorities that apply to the project and contract.

Extras must be monitored very closely by the project manager because they can greatly affect the cost objective of the project. The project manager must be conscious of the fact that contractors make their largest profits on extras. The reason for this is that the contract is let on a competitive basis where contractors have an incentive to keep the price low to obtain the business. With an extra, the contractor has no competition from other contractors. The contractor will usually charge premium prices under such circumstances.

While extras should be monitored with care and avoided when possible, they are an important and useful part of the contracting process. Designers are human and sometimes make mistakes which must be corrected during the construction phase. Unforeseen conditions such as undetected rock, unstable soil conditions, or deterioration of services or facilities assumed to be sound can arise. Circumstances may change to the extent that it makes little sense to go ahead with the work without first making changes. In cases such as these, arranging an extra is the only reasonable way to deal with the situation.

A well-prepared cost estimate has an allowance for contingencies and if the project is well managed, there will be funds available within the budget for reasonable extras. However, extras frequently require the project manager to obtain additional financial approval and funds for the project. This can cause serious administrative delays and/or loss of management credibility.

Contract Completion - Quality control and attention to progress payments and extras make up the main activities of the project manager while the construction contract is in progress. When the contract reaches the completion stage, several additional activities are required. First, the contractor should be given an indication of what work is left to be done. This is accomplished by means of an interim completion certificate which indicates that everything is finished with the exception of clearly specified items. These items make up what is called the deficiency list. The interim completion certificate not only lets the contractor know what work remains, but it can, under certain circumstances, allow the community to take over and start using the facility. The contractor is only responsible for completing the items specified on the deficiency list.

Once the contractor satisfactorily completes the deficiency list, the project manager will arrange for issuing a final completion certificate, which marks the end of the contractor's obligations. The

project manager will make arrangements to take over the project from the contractor. This will involve the final payment plus release of holdbacks. At this point, the contractor's securities or bonds are returned and the contractor's insurance policies are cancelled.

It may be noted that the contractor is still responsible for the warranty. This warranty period will be discussed in the next part.

5.5.7 CN1 Contract Administration Training Publication: *CONSTRUCTION CONTRACTING GUIDELINES FOR FIRST NATIONS AND ABORIGINAL COMMUNITIES*

CN1 is a very useful guide for the project manager. Contracting can be complex and contractors usually have more experience than project managers with the legal aspects of the work they do. If, at all possible, the project manager should ensure that he or she has the services or at least, the advice of an experienced contract administrator. However, whether a contract administrator is available on a full-time basis or not, CN1 provides a good reference document which deals specifically with capital construction project management.
CN1 is based on the experience gained from thousands of construction contracts, and the lessons learned on these jobs. The document provides the community with an important element of protection because its wording has a good chance of standing up under legal scrutiny. In addition, contractors are familiar with the recommended procedures because they follow a contracting practice which is common in the construction business.

CN1 is divided into five sections: an introduction, tenders, contract award, administration of the contract, and claims and disputes. It also contains several appendices. A brief description of each follows.

SECTION 1 - INTRODUCTION: The introduction provides a definition of a construction contract, and specifies the types of work which can be implemented using a construction contract.

SECTION 2 - TENDER CALL: This section gives definitions of contracting terms such as tender, bid bond, security deposit and addendum.

It also provides information or direction on such things as:

1. the documents which should make up the contract package;

2. guidelines on advertising, distributing the contract documents, making changes (e.g. raising addenda) and extending the tender closing date;

3. procedures for opening tenders;

4. procedures for handling security deposits and surety bonds;

5. procedures for reviewing the tenders; and

6. guidelines on how to cancel a tender call after the tenders have been received.

Appendices 2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-8, 2-9, 2-10 and 2-11 contain:

1. a description of the construction tender call work flow process;

2. procedures to use when tenders are invited rather than processed through a public tender call;

3. procedures for having the contractor name the subcontractors;

4. information on acceptable types and amounts of bid security;

5. advice on what to do if errors are found in the contractor's unit price tender computations;

6. sample bid bond;

7. a sample set of tender documents to use for a project valued at under $30,000;

8. a sample set of tender documents to be used for a project valued between $30,000 and $100,000;

9. a sample set of tender documents to be used for projects valued over $100,000;

10. sample newspaper advertisement; and

11. sample letter of invitation to tender.

SECTION 3 - CONTRACT AWARD: Generally, this section contains guidelines on making a contract award. The material deals with:

1. recommended policy regarding contract awards;

2. approval of the award;

3. methods of notifying the successful and unsuccessful contractor(s);

4. the contract security and insurance required; and

5. preparing and signing the contract documents.

Appendices 3-1, 3-2, 3-3 and 3-4 contain:

1. a work flow for awarding a contract;

2. a sample performance bond containing appropriate wording and format;

3. a sample labour and material payment bond containing appropriate wording and format; and

4. information on who can legally sign a contract on behalf of the contractor.

SECTION 4 - ADMINISTRATION AND MANAGEMENT OF THE CONTRACT:
This section contains recommended procedures on managing the contract after it has been approved. Information is provided on:

1. preparing the approved contract for award and signature;

2. what to do if the contractor will not enter a contract;

3. requirements for contract security and insurance;

4. requirements to return the tender security once the contract security is obtained;

5. procedures to follow if the contractor fails to begin work;

6. methods of increasing or decreasing the scope of work;

7. the requirement for advising the bonding company if the contract is changed;

8. appropriate action to take if the contractor does not keep the work on schedule;

9. action to take if claims are received from the subcontractors or suppliers;

10. procedures for progress payments, holdbacks, and statutory declarations;

11. certifying progress payments;

12. raising the interim certificate of completion;

13. conducting an inspection to verify the interim certificate of completion;

14. action required in support of warranties;

15. clearances required before release of final progress payment;

16. rectifying deficiencies by contractors;

17. required action if the contractor fails to perform the work;

18. procedures for taking work out of the contractors hands including dealing with the bonding company and termination of the contract;
19. procedures for releasing the contract security deposit and insurance;

20. processing the final certificate of completion;

21. requirements for project cost-evaluation; and
22. contract record required.

Appendices 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, and 4-7 show example forms (the wording and format are provided) of the following documents:

1. change order;

2. request for progress payment;

3. statutory declaration;

4. interim certificate of completion;

5. final certificate of completion;

6. inspection and acceptance; and

7. cost breakdown for unit price or combined price contract.

SECTION 5 - CLAIMS AND DISPUTES: The purpose of this section is to give project managers direction on the proper procedures for handling claims and disputes. The information assists the project manager in knowing the types of activities which may result in a claim or a dispute. In addition, it gives him or her a better knowledge of the types of obligations the contractor has.

Procedures for handling disputes and related advice (e.g. the need to act quickly, obtain legal advice, keep records, and do business in writing) are provided. Normally, accepted methods for computing the cost of a claim is provided. As well, the methods (e.g. negotiation, mediation, arbitration) by which claims can be resolved are also outlined.

Part 6: Takeover and In-Service

6.1 General

The final phase of a construction project is called the take over and in-service phase. It is often the most neglected part of the entire project. Many projects which should have been successful encounter problems near the end. There are a number of reasons for this, for example, the project runs out of money; the small, but difficult problems allowed to accumulate must finally be addressed; the staff working on the project attempt to prolong their employment; the staff leave before the work is finished and interest by the end users rises sharply and pressure for extras is applied. An additional reason for projects getting into trouble at the end involves the natural tendency which often exists for a mental and physical slow down when the project is almost over. The project manager may be inclined to relax too soon and not ensure that everything is well managed to the end.

The project manager has two main areas of responsibility in the take over and in-service phase. First, construction activities must be finalized. The definition of a project given in Part 1.0 referred to the requirement for a project to have a clearly identified end. The first section in this Part discusses this subject and suggests the types of activities which should be involved in finalizing the project. The second area of concern is to ensure that the operational and maintenance activities for the facility are correctly and effectively begun. The final section in this part discusses the types of things required to do this.

6.2 Finalizing Construction

The project manager must make every attempt to ensure that all loose ends are attended to before the project is finalized. This includes such things as final clean-up, returning borrowed or rented equipment, disposing of surplus material by returning it to suppliers for credits or turning it over to the community, and arranging to discontinue temporary project services.

The project's time and cost objectives were set in terms of a specific date and number of dollars. When more time is still required to complete the project or more money must be spent, the project has not yet met those objectives. Good project management practice requires the project manager to bring the project to a definite stop with no more work or expenditure.

As far as a project implemented by contract is concerned, the process of finalizing it is usually relatively simple. The final certificate of completion, which is shown in CN1, brings the work to an official end. The contractor is interested in completing the obligations of the contract so final payments can be received, insurance coverage dropped, and people and equipment redirected to other work. The project manager must ensure that the deficiency list is complete and the contractor has in fact rectified everything before the final certificate of completion is signed.
Projects which are implemented by day labour can be more difficult to terminate than ones which are done by contract. The project manager should be aware of this and obtain the assistance and

co-operation of the project team, band manager, building committee, and chief and council in being decisive and firm on this point.

Wages are a high cost item. The employment of all the project staff, including the project manager, must be terminated.

It will be necessary to set a deadline on the authorization of any new or revised work. A specific date must be set beyond which all work must be completed. It will be necessary to resist any pressures to extend this time. One of the most effective ways for the project manager to end a project is to have the funds cut off. Be reasonable, but firm.

6.3 Facility Operation and Maintenance

When the project manager's personal association with the project is ending, there is an important responsibility to ensure that the in-service life of the facility begins correctly.

As noted in an earlier part, one of the things which must be done during the planning, design and construction phases is to prepare the operation and maintenance staff (referred to as the O&M staff) for their responsibilities to look after the new facility. If the facility is to be part of a maintenance management or inventory control system, then the necessary arrangements should be made. The O&M staff should have received the necessary training and the equipment or facility operating manuals should be available. The needed materials should be available and any other arrangements should have been made. This can include such things as purchasing or arranging for chemicals, cleaning compounds, spare parts, tools, contracts, utility services and security.

It is seldom if ever possible to construct a facility exactly as it was designed (i.e. precisely in accordance with the drawings and specifications). A number of circumstances such as inadvertent mistakes on the drawings or specifications, unforeseen site conditions which necessitate changes, inability to purchase a certain type of material or equipment, or authorized additions/deletions from the original design cause the facility to be built differently from that shown on the drawings. If these changes are not recorded they can cause serious problems in later years when items such as buried utility lines are not where the drawings show or equipment and material are not as indicated. Accepted construction practice is to record (referred to as "marking up") any and all changes on a set of drawings as the construction phase progresses. This is done by neatly sketching in red the changes which are made. The design consultant then makes these changes on the original drawings and gives the community a copy. The project manager should ensure that a copy of these "as built drawings" are safely stored where they are always available to those responsible for O&M.

6.4 Warranties

Contracts for construction work normally call for a warranty period, usually one year, in which the contractor will rectify any latent defects in the construction. As well, pieces of equipment (e.g. motors, furnaces, pumps) may not only have the contractor's one year warranty period, but an additional guarantee supplied by the manufacturer. It must be kept in mind that these guarantees/warranties are not "free" because the costs are built into the purchase price. Therefore, a community is paying twice for the service if those warranties/guarantees are not used when necessary. It is therefore important for the project manager to list guarantees and warranties which do exist and indicate the appropriate follow-up action needed. (Note: This can be done in the "project completion report" which is discussed below). In some cases, the community may make arrangements with the project manager to do the follow-up action. This will be a feasible approach when the project manager is a member of the local community or continues to be employed by the community in some other capacity. Usually, a thorough inspection is carried out around the tenth month so warranty work can be requested before the year is up.

6.5 Project Completion Report

Preparation of the project completion report is normally the last function carried out by the project manager. The project completion report should provide information on the following topics:

1. a brief history of the project's important dates and events such as approvals, start, completion dates; serious accidents; visits by important persons; and severe weather which affected construction;

2. the project's time, cost, and quality objectives and any discrepancies in achieving those objectives;

3. where the project files, as built drawings, maintenance and operation manuals, and any other project documents have been stored;

4. the names and addresses of contractors, subcontractors, and other key people or firms involved. A brief description of their involvement in the project should be added;

5. what action must be taken with regard to warranties/guarantees;

6. important lessons learned (e.g. if the project were to be done over again what specific things should be done differently); and

7. the project's weak and strong points.

The project completion report need not be long or detailed. Sticking to facts and avoiding detailed explanations will make the report useful and quick to prepare.
Appendix I contains a sample evaluation report outline which could be used for a typical large project.

APPENDIX A

Sample Project Management Checklist

The following checklist is designed for project managers. The action items and who is responsible for them is based on this manual, but they should be regarded as typical examples. It is assumed that those activities which would be carried out by the building committee are included with those for the chief and council. Contributing agencies (e.g. government departments, other municipalities, private organizations) include those which make a financial contribution or have some other legitimate interest which requires their approval or concurrence. Consultants and contractors can include several different firms contracted for various parts of the project. Others would include such persons as contract administrators, band office staff, construction manager.

The checklist assumes that the major managerial activities are carried out by the project manager, project team, chief and council, contributing agencies, consultants, contractors, and others.

For convenience in using the checklist, it is also assumed that five principle types of action can take place. These actions are doing, initiating, assisting, approving, and concurring. These actions are abbreviated as follows:

D - Do
I - Initiate
AST - Assist
A - Approve
C - Concur

ACTIVITIES	PROJECT TEAM	PROJECT MANAGER	CHIEF & COUNCIL	FUNDING AGENCIES	CONSULTANT / CONTRACTOR	OTHER
INITIATION PHASE						
1. Review community plan			D			
2. Bring community plan up to date			I		D	
3. Rank importance of different projects			D			
4. Choose project to be implemented			D	C		
5. Clarify project aims			D			AST
6. Consider project impacts			D			AST
7. Define project objectives			D			AST
8. Develop level 4 estimate			D			AST
9. Certify availability of resources	D		C			
10. Decide to proceed with project	D		C			
11. Hire project manager		C	D			
PLANNING PHASE						
1. Review project		D				
2. Organize project team	C	D	C			
3. Prepare implementation plan	AST	D	A	C		
4. Feasibility studies	C	I			D	
5. Environmental screening	C	I			D	
6. Life cycle costing	C	I			D	
7. Option analysis	C	I			D	
8. Develop level 3 estimate	C	D			AST	
9. Prepare design and construction plan	AST	D	A			
10. Decide to proceed with project	C	I	D			
DESIGN PHASE						
1. Prepare terms of reference for design contract	AST	D	C			AST
2. Request proposals		I				D
3. Review proposals and recommend consultant	D	I				AST
4. Approve consultant		I	A			D

LEGEND D - do I - initiate AST - assist A - approve C - concur

ACTIVITIES	PROJECT TEAM	PROJECT MANAGER	CHIEF & COUNCIL	FUNDING AGENCIES	CONSULTANT / CONTRACTOR	OTHER
DESIGN PHASE CONTINUED...						
5. Complete preliminary design (30%)					D	
6. Review prelim. design and level 2 estimate	D	I	C	AST		
7. Complete design to 60% stage					D	
8. Review design at 60% stage	D	I	C	AST		
9. Complete design to 90% stage & prepare level 1 estimate					D	
10. Review design and level 1 estimate	D	I	C	AST		
11. Finalize design	C	C			D	
12. Take decision to proceed to construction phase			A	A	C	
CONSTRUCTION PHASE (DAY LABOUR)						
1. Review design (drawings, specifications, bills of material, day labour plan)	AST	D				AST
2. Set up control system (cash plan, schedule, accounting, inspection)	AST	I				D
3. Hire supervisors		D				AST
4. Arrange support services		I				D
5. Order materials		I				D
6. Hire workers		I				D
7. Arrange safety and security requirements		I				D
8. Carry out time, cost, and quality control (meetings, schedule reviews, reports, site visits, consultations)	C	A				D
9. Day-to-day communication and problem solving	AST	D				AST
10. Finalize construction	AST	I	C	C		D
CONSTRUCTION PHASE (CONTRACT)						
1. Prepare contract documents		D			*	AST
2. Invite open or closed bids		D	C		*	AST
3. Set up control system (inspection, financial, control, contract admin)	AST	I			*	D
4. Answer queries from prospective contractors	AST	D			*	AST

LEGEND: D - do I - initiate AST - assist A - approve C - concur

* A consultant may be hired to either assist or carry out this function on behalf of the project manager

** Authority to approve may vary with the type and cost of extra.

ACTIVITIES	PROJECT TEAM	PROJECT MANAGER	CHIEF & COUNCIL	FUNDING AGENCIES	CONSULTANT / CONTRACTOR	OTHER
CONSTRUCTION PHASE (CONTRACT) CONTINUED...						
5. Open tenders and recommend successful contractor	AST	D			*	AST
6. Award contract		D	A	A		AST
7. Carry out construction					D	
8. Carry out quality control	AST	I			*	D
9. Assess, seek approval for, and process contract extras		D	A **			AST
10. Monitor construction and carry out day-to-day communications and problem solving	AST	D				AST
11. Prepare and approve interim completion certificate	AST	A			*	D
12. Monitor completion of deficiency list		I			*	D
13. Prepare and approve final completion certificate		I	A		*	D
TAKE OVER & IN-SERVICE PHASE						
1. Finalize financial arrangements (with banks, suppliers, contractors, labour)	AST	D				AST
2. Return borrowed equipment & sell (credit project) or turn over surplus stocks of materials to community		D				AST
3. Arrange storage of project file, as-built drawings, operating and maintenance manuals, and warranties/guarantees		D				AST
4. Prepare project completion report	AST	D				
5. Brief appropriate authority (band manager, O&M staff) on requirements for conducting warranty inspections		D				AST
6. Set specific date on which responsibility for facility will be turned over from project manager to users. Ensure appropriate O&M staff are aware		D	C			AST

LEGEND: D - do I - initiate AST - assist A - approve C - concur

* A consultant may be hired to either assist or carry out this function on behalf of the project manager.

** Authority to approve may vary with the type and cost of extra.

APPENDIX B

Job Description Specimen

Following is a sample job description for the position of project manager. Note that it is written for a specific project, and the duties and other details refer to it. You may use this job description as a pattern and change the details to suit your own project. Keep in mind, however, that it should be as detailed and specific as the sample.

PROJECT MANAGER – Job Description

Community : _____
Date : _____

Overview of Responsibilities :

The project manager will be responsible for the planning, design, construction and take over of a six classroom community school which will be complete with gymnasium, industrial arts and home economics classrooms, plus a playground. The school will be constructed within the applicable scales of accommodation and building codes. The new facility will have an appearance which will match other new First Nation buildings and the cultural heritage of the _____. The facilities will be completed and ready for occupancy for the first school year which begins three years from this date. The total cost of the project will not exceed 5.2 million dollars.

Duties :

The project manager will be responsible for achieving the time, cost, and quality objectives described in the Overview of Responsibilities section of this Job Description. The following specific duties will be included:

General

- Be directly responsible to the Chairperson of the Building Committee from whom authority and direction on behalf of the Chief and Council will be obtained. Note: The organization and reporting relationships will be in accordance with the organization diagram shown in *Annex A*.

- Provide a written and verbal report to the Chief and Council in the band office at 8:00 p.m., on

the first Thursday of each month. These reports will be provided throughout the life of the project. Except in cases where specific information or a milestone, as described elsewhere in this job description must be addressed, the project manager's report will compare actual progress on the projects objectives (i.e. time, cost and quality) with that scheduled. Highlights on any special events, problems or other occurrences with which the Chief and Council should be familiar will be included.

- Seek the approval, advice, or assistance of the Chairperson of the Building Committee with any decision or special problem which requires the immediate attention of the Building Committee or Band Chief and Council.

- Set the experience and qualification standards for those persons who will be employed on the project in a day labour capacity. Note: Community employment will be subject to the hourly rates, disciplinary practices, and general conditions of employment as set out in the band by-laws.

- Ensure that a minimum of 75% of the total labour required to implement the project is carried out by community personnel. Note: Professional services and consulting work is exempt from this stipulation.

- Regarding the 75% local labour requirement of this project, ensure the necessary training or upgrading to achieve this goal is planned and carried out. Note: The project manager is at liberty to achieve the 75% requirement by arranging the necessary conditions in a contract(s) and/or carrying out parts of the work on a day labour basis.

- Make financial decisions to the following limits:

  (1) individual changes of a technical nature resulting from site conditions or oversights in the design which are valued at under $5,000, and which do not increase the approved level of service. Note: Uncommitted money must be available in the contingency allowance; and

  (2) single purchases of material or rental of equipment which do not exceed $500 in value. Note: Uncommitted money must be available in the contingency allowance.

- Seek the approval for further delegation of financial authority from the band chief and council when the combined total of all financial transactions authorized by the project manager exceeds $25,000.

- Adhere to band by-laws concerning contracting and purchasing policies for all transactions which exceed the limits of the financial authority delegated to the project manager.

- Ensure that good financial practices are exercised throughout the life of the project by developing the expenditure plan, monitoring the cash flow, and reserving monies for all project commitments.

- Ensure that invoices are paid promptly and complete financial records are maintained. Note: Any issues of a financial nature which cannot be resolved by the project manager will be referred to the project team, band manager, or chairperson of the building committee, as applicable.

- Provide the necessary control, direction and monitoring of the organizations (e.g. contractors, consultants, suppliers) retained to work on the project.

- Make the necessary provision for the supervision and productivity, safety, and job related support for persons hired by the community to work on the project.

- Maintain a project file which contains copies of all documents such as reports, agreements, summaries of costs, records of activities/milestones/events, and minutes of meetings needed to maintain a complete record of the project.

- Provide agencies (e.g. Government, financial, commercial) with the information or services required under agreements with the community or specifically called for in project documents.

Planning Phase

- Verify the general accuracy of the objectives outlined in the "Overview of Responsibility" section of this job description.

- Assemble a project team and reach agreement on the terms of reference and duties for each member.

- Develop and/or implement the following planning phase activities:

  (1) feasibility studies and option analysis;
  (2) level three cost estimate (to include a life cycle cost analysis);
  (3) facility operation and maintenance plan;
  (4) project schedule showing time plotted against major milestones, and construction phase activities;
  (5) cash flow plan;
  (6) quality assurance plan;
  (7) consultant/contractor selection (including design review, quality assurance, documentation and job take-over) plans; and
  (8) personnel and material control procedures.

Design Phase

- Implement procedures contained in CN2, *"Contracting for Professional Services by First Nations and Aboriginal Communities."* The following will make up the principal activities:

  (1) Develop terms of reference and other contract documentation required for consultant selection. (Note: These contract documents will require the consultant to develop a design which will meet the time, cost and quality objectives of the project. The consultant will be required to develop a level two estimate at the 30% design completion stage and a level one estimate at the 90% design completion stage).

  (2) Chair a consultant selection committee as organized under the direction of the band manager. (Note: The project manager will ensure the required expertise is represented on that committee).

  (3) Provide the direction, assistance, and information required by the consultant throughout the design phase.

  (4) Make arrangements to have the design and working drawings reviewed by the project team and approved by the chief and council at the 30%, 60% and 90% completion stages.

  (5) Certify the consultant's invoices and ensure the terms of the contract are adhered to.

Construction Phase

For the portion of the project carried out by contract, the project manager will implement the procedures contained in CN1. The following principal activities will be included:

(1) Develop terms of reference and other contract documentation required by the band manager.

(2) Chair the contract award committee. (Note: This will include ensuring that the required expertise is represented).

(3) Monitor the contractor throughout the construction. (Note: This will include implementing the quality assurance plan, reviewing the contractor's monthly status reports, authorizing the contractor's requests for payment, and preparing the interim and final certificates of completion).

For that portion of the project carried out by day labour, the following will make up the principal activities involved:

(1) Prepare the job description for the construction manager and other persons directly supervised by the project manager.

(2) Supervision of the construction manager throughout the construction phase to ensure that adequate standards regarding quality, productivity, worker safety, and security are being maintained.

(3) Receive and review weekly reports from the construction manager, and investigate any problem areas.

(4) Ensure that administrative and financial services including personnel records, payrolls, material control, and insurance coverage are being maintained and provided.

Take-Over Phase

- Prepare a comprehensive completion report and submit it to the chairperson of the building committee.

- Turn over to the band manager one copy of the project's as built drawings, warranties, and the project file.

- Provide the community maintenance superintendent with a copy of the as built drawings and maintenance and operation manuals. This should include provision of any briefings required.

Judgement :

Judgement is required in assessing the technical, political and administrative implications of decisions. Decisions which must be made include the implementation methods to use to achieve the 75% local labour input; the approaches to use when dealing with community leaders, members of the project team, contributing organizations, contractors/suppliers, supervisors, workers; and recognizing the relative importance and urgency of the various problems which arise.

Experience, Knowledge, and Education :

The project manager must have a good knowledge of the progressive development and phases of a project (i.e. activities involved in initiation, planning, design, construction and take over). He or she must have a general knowledge of construction techniques, quality and cost control, contracting procedures, scheduling, design procedures, feasibility studies, option analysis, life cycle cost analysis, community organizations, report preparation, and interpersonal management techniques. These qualifications are normally acquired through university graduation in an engineering discipline plus three years progressive experience in managing capital construction projects.

The requirement for university graduation will be waived if the candidate can demonstrate a thorough knowledge of the relevant subjects plus a six-year record of successfully managing equivalent types and

sizes of projects.

Interpersonal Skills :

The position requires the ability to guide the collective efforts of a wide range of personality types and interests toward achievement of the project objectives.

Supervision :

Direct supervision of the construction manager and supervisor of financial and administrative support is required. The activities of contractors, consultants and suppliers must be co-ordinated. The project manager works under the direct control of the chairperson of the building committee. In addition, she or he must co-ordinate activities with the members of the project team and the band manager.

Initiative :

A high degree of personal initiative is required to maintain personal enthusiasm and momentum; carry out feasibility studies, cost estimates, option analysis, life cycle cost analysis; ensure that control mechanisms are in place to monitor cash flow, schedules, adherence to building codes, safety procedures; develop contract documents; and organize and effectively co-ordinate the project team.

Signatures

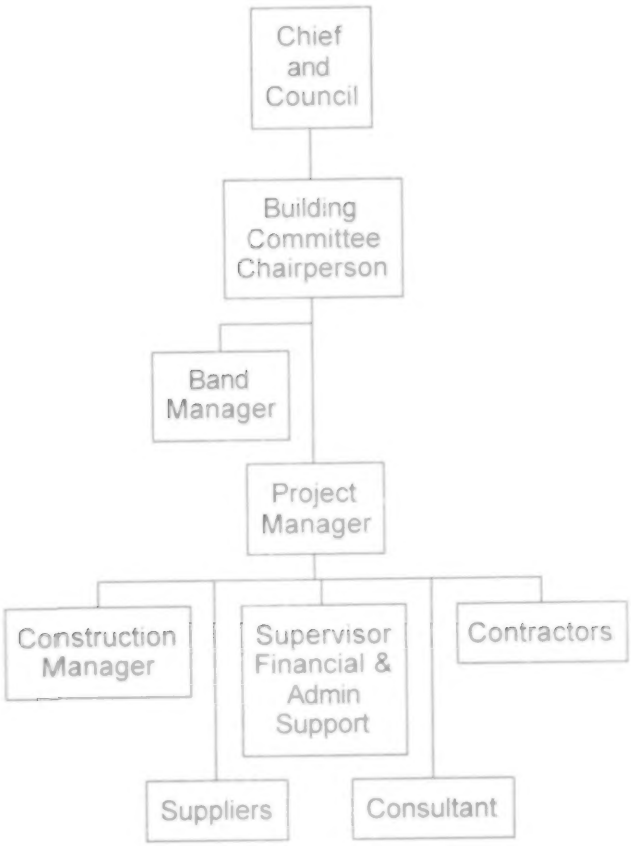
_____ _____

Chairperson Building Committee Date

_____ _____

Project Manager Date

Annex A to Appendix B



APPENDIX C

Project Manager's Code of Ethics

This code of ethics was developed by the Project Management Institute. It has been reprinted here with permission.

Code of Ethics for Project Managers

PREAMBLE Project managers, in the pursuit of their profession, affect the quality of life for all people in our society. Therefore, it is vital that project managers conduct their work in an ethical manner to earn and maintain the confidence of team members, colleagues, employees, employers, clients and the public.

ARTICLE I Project managers shall maintain high standards of personal and professional conduct, and:

a. accept responsibility for their actions;

b. undertake projects and accept responsibility only if qualified by training or experience, or after full disclosure to their employers or clients of pertinent qualifications;

c. maintain their professional skills at the state of the art and recognize the importance of continued personal development and education;

d. advance the integrity and prestige of the profession by practising in a dignified manner;

e. support this code and encourage colleagues and co-workers to act in accordance with this code;

f. support the professional society by actively participating and encouraging colleagues and co-workers to participate;

g. obey the laws of the country in which work is being performed.

ARTICLE II Project managers shall, in their work:

a. provide the necessary project leadership to promote maximum productivity while striving to minimize costs;

b. apply state of the art project management tools and techniques to ensure quality, cost and time objectives, as set forth in the project plan, are met;

c. treat fairly all project team members, colleagues and co-workers, regardless of race, religion, sex, age or national origin;

d. protect project team members from physical and mental harm;

e. provide suitable working conditions and opportunities for project team members;

f. seek, accept and offer honest criticism of work, and properly credit the contribution of others;

g. assist project team members, colleagues and co-workers in their professional development.

ARTICLE III Project managers shall, in their relations with employers and clients:

a. act as faithful agents or trustees for their employers and clients in professional or business matters;

b. keep information on the business affairs or technical processes of an employer or client in confidence while employed, and later, until such information is properly released;

c. inform their employers, clients, professional societies or public agencies of which they are members or to which they may make any presentations, of any circumstances that could lead to a conflict of interest;

d. neither give nor accept, directly or indirectly, any gift, payment or service of more than ***/ nominal value to or from those having business relationships with their employers or clients;

e. be honest and realistic in reporting project quality, cost and time.

ARTICLE IV Project managers shall, in fulfilling their responsibilities to the community:

a. protect the safety, health and welfare of the public and speak out against abuses in these areas affecting public interest;

b. seek to extend public knowledge and appreciation of the project management profession and its achievements.

APPENDIX D

Sample Project Budget

	1996/97	1997/98	1998/99	1999/00	TOTAL
I Construction Costs (1996 constant $)					
a) School buildings (1,414.8 sq m) cost per sq m : $1,950		$41,500	$1,682,400	$1,034,200	$2,758,100
b) Teacherages (675.5 sq m) cost per sq m : $1,100		7,400	468,200	267,500	743,100
c) Site services - water system (2,641 m) cost per m $260		48,100	480,700	157,900	686,700
- sewer system (2,300 m) cost per m $260			514,300	83,700	598,000
- roads & drainage (0.8 km) cost per km $410,000			262,400	65,600	328,000
- power (0.8 km) cost per km $160,000			88,800	31,200	120,000
d) Site development (6.5 ha) cost per ha : $55,000			264,600	92,900	357,500
Total Construction Costs		**$97,000**	**$3,761,400**	**$1,733,000**	**$5,591,400**
II Non-construction Costs (1996 constant $)					
a) Design	72,300	113,000			185,300
b) Construction Supervision			90,900	27,200	118,100
c) Project Management	8,700	63,800	133,400	84,400	289,900
d) Band Administration	60,600	11,200		19,600	91,400
e) Other (survey, soil testing, etc.)	7,300	5,500	24,100	8,600	45,500
Total Non-construction Costs	**$148,900**	**$193,500**	**$248,400**	**$139,400**	**$730,200**
III Contingencies (10% of construction)	$0	$9,700	$376,140	$173,300	$559,140
IV Total Proj. Costs (1996 constant $) = I + II + III	**$148,900**	**$300,200**	**$4,385,940**	**$2,045,700**	**$6,880,740**
V Escalation Factors			1.5 %	1.5 %	
VI Total Project Costs (current $)	**$148,900**	**$300,200**	**$4,451,729**	**$2,076,386**	**$6,997,215**

APPENDIX E

Sample Cash Plan

Sample Cash Plan for Fiscal Year 1998/99

Project:

Community:

Project Estimate: $7,008,300
Fiscal Year Estimate: $4,451,700

MONTH	CASH PLAN
April	$ 89,000
May	222,600
June	445,200
July	667,800
August	890,300
September	890,300
October	445,200
November	445,200
December	356,100
January	--
February	--
March	--
TOTAL	**$ 4,451,700**

APPENDIX F

Activity List

Activity List – Construction of small concrete block building.

ACTIVITY	TIME
Layout work	2 hours
Excavate	4 hours
Erect formwork	4 hours
Pour footings	2 hours
Cure concrete footings	2 days
Strip formwork	1 hour
Place and compact grand fill	6 hours
Pour concrete slab	4 hours
Cure concrete slab	2 days
Cut lumber	5 hours
Make door and window casings	4 hours
Assemble roof trusses	1 day
Lay block (start)	4 hours
Install casings	6 hours
Lay block (finish)	6 hours
Erect roof trusses	4 hours
Sheath roof	4 hours
Shingle roof	6 hours
Install doors and windows	6 hours
Paint woodwork	1 day
Clean-up	6 hours

APPENDIX G

Specimen: Bar Chart

		Month 1						Month 2					Month 3	
	Week Ending >	3	10	17	24	1	8	15	22	29	5	12	19	26
	Working Days >	2	7	11	16	21	26	31	36	40	45	50	55	60
%	ELEMENT													
100	Excavation and Backfill													
	Concrete foundation and slab													
90	Exterior walls													
80	Roof and sheet metal													
70	Interior framing													
60	Millwork - finishing													
	Electrical													
40	Plumbing													
30	Heat and ventilation													
	Painting and decorating													
20	Floor covering													
10	Landscaping, incl. Sodding													
	Correct def													
0	Turnover													

APPENDIX H

Project Cost Control System

General

The cost control system illustrated in this appendix is designed to give the project manager financial control over the costs of a project by breaking it down and managing it in parts. (Note: It must be kept in mind that the project manager will also require a procedure for raising cheques and keeping an accurate record on bank balances. As well, the band manager or other authority may require some additional type of financial record. Each system gives a different perspective and acts as a cross check on the other.)

This cost control system allows the project manager to know at a glance what parts of the project are going well and what parts require attention. As well, it provides an excellent financial record of the project, and allows an outside agency such as an auditor to see how funds were appropriated and spent.

It may be noted that the procedures described in this appendix are easily set up on a computer spreadsheet application.

The Cost Control System

The project manager must first decide how the project will be broken down for control purposes – what parts (ie. cost elements) of the project will be isolated so they can be cost controlled separately within the rest of the project.

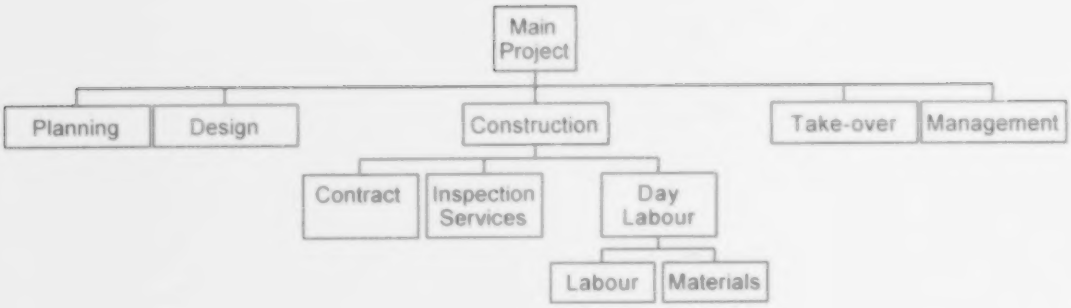
The project manager can use any breakdown she or he wants; however, an estimate or budget must be available for each part. For example, the project manager may want to control a project, which is being implemented by contract, by dividing it into separate cost elements for planning, design, contract, contingencies, inspection, and management. If the project were to be implemented without a contract the same breakdown might be chosen, except day labour would be used instead of contract.

The project manager might feel that day labour is too broad a category for the construction phase. For better control, he or she might break it down further into labour and materials. In fact, a large day labour project might be broken down into site preparation, excavation, foundations, structural framing, electrical, interior finish, etc. with an additional breakdown of equipment, labour, and materials for each.

When a cost element is subdivided, the new parts are called sub-cost elements. Sub-cost elements may themselves be broken down into additional subdivisions.

The following diagram illustrates how a typical project could be broken down into cost and sub-cost elements.

FIGURE 1



In Figure 1:

- each item (e.g. main project, planning, contract, labour) is called a cost element;
- each item which is below another item in the diagram and connected to it is also called a sub-cost element (e.g. planning, design, construction, take-over and management are sub-cost elements of day labour; contract, day labour, and inspection services are sub-cost elements of construction);
- sub-cost elements are a further financial breakdown of the cost element;
- the project can be broken down into any number of cost elements or sub-cost elements depending on how many individual items the project manager wishes to cost control.

Referring to Figure 1, the total budget for the main project is broken down among its sub-cost elements (ie. planning, design, construction, take-over, and management). Secondly, a further breakdown is made (i.e. construction is broken down into contract, day labour, and inspection services). A third level breakdown is made to day labour by dividing it into labour and material.

Relating the above from a financial accounting point of view it can be said that once a budget is established for a project, the budget can be broken down or credited to its cost and cost sub-elements. A second, third or further crediting can take place to sub-cost elements. Using the same example as above the, the foregoing is illustrated in Figure 2.

FIGURE 2

Figure 2 shows the total budget for the project is $1,500,000. This budget is broken down into $30,000 for planning, $65,000 to be spent on design, $1,325,000 to be spent on construction, $5,000 to be spent on the take-over, and $75,000 to be spent on management. This means that all the money (i.e. $1,500,000) for the main project has been assigned to five sub-cost elements.

Figure 2 indicates that the project manager is satisfied that the $30,000 in planning need not be broken down into sub-cost elements (i.e. accounting for the money within the $30,000 budget gives the project manager the degree of control desired). The same applies to design, take-over, and management.

Construction, in this example, is considered to be the more complex activity and the one which involves the greatest amount of money. The project manger has decided to control the construction by breaking the $1,325,000 construction budget down into three sub-cost elements (i.e. $800,000 for the contract, $510,000 for the day labour, and $15,000 for inspection services). Figure 2 also indicates that the project manager is satisfied with using the contract and inspection services as control elements; however, the day labour is considered too broad a category and it is further subdivided into an additional level for labour and material.

Notes on the Cost Control System: Following the standardized procedures will make this cost control system function more effectively. Several of the points to keep in mind are outlined below.

It is normal to make direct charges against a sub-cost element only (i.e. all invoices or other types of expenditures for the project are charged or debited to the lowest possible sub-cost element). Any charge involving construction must be charged to either contract, labour, material or inspection services. The expenditure will of course be reflected in the cost element when the

project manager does a summary.
A review of each sub-cost element gives the project manager an idea of what parts of the project are on or near budget, what parts might be over budget (e.g. in trouble), and what parts have actual or potential surpluses. Money is debited, credited, or transferred by means of cost card entries which will be discussed in the next part. Remember that this is a paper exercise; however, this type of information gives the project manager an excellent insight into the cost status of the project at any time.

Unexpended funds can be moved from one sub-cost element back to the cost element and then redirected to another sub-cost element. This gives the project manager flexibility in making financial adjustments as the project proceeds.

The project manager, if he or she chooses, may leave uncommitted balances in a cost element. This may be done to cover future foreseen or unforeseen expenses. An alternative to this would be to credit a contingency sub-cost element with any surpluses or uncommitted funds.

The Cost Card

Attachment 1 at the end of this appendix shows a sample "cost card" which can be used for the cost control system just described. A separate cost card is maintained for each cost and sub-cost element. The cost card provides a financial record for each specific area chosen by the project manager.

Each area on Attachment 1 which is identified with the letters "a" to "j" issues as follows:

- Space "a": There are two types of cost cards - type 1 and 2. Space "a" is used to indicate the type. A type 1 is used to record cost element information - that means the cost element has an additional breakdown into sub cost elements. In Figure 2 a cost element card would be used for the main project, construction, and day labour. Type 2 is used when the card records sub cost element financial information - that is the card is used to debit direct project costs. In Figure 2 a sub cost element card would be used for planning, design, take over, management, contract, inspection services, labour and materials.

- Space "b": The title of the cost element (or sub cost element) is recorded in this space. The cost card should be given a clear descriptive name so that elements are not confused with each other.

- Space "c": The project title is recorded in this space.

- Space "d": This space is used to identify the community or area where the project is taking place. The project manager should design a cost card which contains any additional information that is needed for identification or reference purposes.

- Space "e": The date on which every cost entry on the cost card is made should be recorded.

- Space "f": The cost entry should be briefly but clearly identified in this space (e.g. what is being cost recorded).

- Space "g": When the cost entry is a credit the amount is recorded in this space.

- Space "h": When the cost entry is a debit the amount is recorded in this space.

- Space "i": This space is used to record the amount of money which is uncommitted (i.e. credits less debits).

- Space "j": The total amount approved for a particular cost element is recorded in this space. This amount may or may not be the same as the total credits recorded in space "g". Credits refer to an actual cash amount which is available (e.g. bank deposit, cash flow) while total approved can include resources which may be available at some future date.

Sample Project

The following example involves a school construction project which will be used to illustrate the cost control system.

The project involves a major structural renovation and provision of new water and sewer services.

On September 15, 1996, the following level three estimate was completed by the project manager:

Feasibility Studies	$	60,000
Design		255,000
Construction	2,185,000	
- Renovation ($1,420,000)		
- Water and Sewer (545,000)		
- Sewage Lagoon ($80,000)		
- Water Storage and Fire Pump ($140,000)		
Temporary Facilities		325,000
Supervision		110,000

Administration		320,000
Contingencies		310,000
	TOTAL	3,565,000

On the same date (i.e. September 15, 1996) the project manager decided to start a cost control system. All the entries shown for September 15, 1996 were made on a project cost card. (Note: See Attachment 2).

On the same date (i.e. September 15, 1996) seven other cost cards were started - one for each of the debit entries shown on the Master Project Cost Card. Refer to Attachments 3, 4 and 5 which are examples of the "Feasibility Studies" "Construction" and "Contingencies" cost cards. The appropriate entries for September 15 are indicated on each.

Because the project manager broke the construction down into four parts (i.e. renovation, water and sewage, sewage lagoon, water storage and fire pump) four additional cost cards were raised for those items. Attachment 6 (Sewage Lagoon) is an example of one of those cards. It also contains the correct entry for September 15, 1996.

Entries after September 15, 1996: The Feasibility Studies Cost Card (i.e. Attachment 3) will be used to illustrate how additional entries are made on the cost cards. On October 21, 1996 an invoice from Geotech, a soil testing company, is received and paid. The entry for October 21, made on Attachment 3, shows the appropriate information. On December 2, 1996 a further invoice for some environmental work completed the feasibility studies (refer to entry on Attachment 3 for December 2). On December 3, 1996, the project manager notes that the feasibility studies are completed but there is an uncommitted balance on the cost card for $11,500. The project manager should decide what to do with this surplus. In this case he or she decided to simply move the money back to the Master Project Cost Card as an uncommitted balance. Refer to entries for December 3, 1996 on Attachments 3 and 2.

Additional Entries: When the project went into the design phase, the level one estimate indicated the sewage lagoon would cost $95,000 instead of the $80,000 the class three estimate had shown. No surpluses anywhere else in the project were identified to pay this extra cost and the project manager decided to use $10,000 from the contingency funds to cover the extra cost. The entries were made on February 5, 1997. Refer to entries on Attachments 2, 4, 5, and 6.

The Project Manager continues to make debits or credits to the appropriate cost cards throughout the life of the project. Reviewing the uncommitted balances puts the project manager in the position to know at any time what the financial status of the entire project or any part of it is. He or she also knows what areas of the project are on target, what areas are performing better than target, and what areas may have a problem.

Attachment 1 to Appendix H

COST CARD

COST CARD TITLE *(b)* PROJECT TITLE *(c)* FIRST NATION *(d)*	CARD USED TO RECORD ELEMENT - cost ____ - sub-cost ____ *(a)*

Date	DESCRIPTION	Credit	Debit	Uncommitted Balance	Total Funds Approved
(e)	*(f)*	*(g)*	*(h)*	*(i)*	*(j)*

Note: Amounts shown are in thousands of dollars

Attachment 2 to Appendix H

COST CARD

COST CARD TITLE *Master Project Cost Card* PROJECT TITLE *School and Services* FIRST NATION *Weareeducated First Nation*	CARD USED TO RECORD ELEMENT - cost X - sub-cost ___

Date	DESCRIPTION	Credit	Debit	Uncommitted Balance	Total Funds Approved
Sep 15 / 96	*Approval in principle of level 3 estimate*	$3,565		$3,565	$3,565
Sep 15 / 96	*To Feasibility Studies Cost Card*		$60	$3,505	
Sep 15 / 96	*To Design Cost Card*		$255	$3,250	
Sep 15 / 96	*To Construction Cost Card*		$2,185	$1,065	
Sep 15 / 96	*To Temporary Facilities Cost Card*		$325	$740	
Sep 15 / 96	*To Supervision Cost Card*		$110	$630	
Sep 15 / 96	*To Administration Cost Card*		$310	$310	
Sep 15 / 96	*To Contingency Cost Card*		$310	$0	
Dec 3 / 96	*From Feasibility Studies Cost Card*	$11.5		$11.5	
Feb 5 / 97	*From Contingency Cost Card*	$10		$21.5	
Feb 5 / 97	*To Construction Cost Card*		$15	$6.5	

Note: Amounts shown are in thousands of dollars

Attachment 3 to Appendix H

COST CARD

COST CARD TITLE *Feasibility Studies* PROJECT TITLE *School and Services* FIRST NATION *Weareeducated First Nation*	CARD USED TO RECORD ELEMENT - cost ____ - sub-cost X

Date	DESCRIPTION	Credit	Debit	Uncommitted Balance	Total Funds Approved
Sep 15 / 96	*Approval in principle of level 3 estimate*	$60		$60	$60
Oct 21 / 96	*To Feasibility Studies Cost Card*		$41	$19	
Dec 2 / 96	*To Design Cost Card*		$7.5	$11.5	
Dec 3 / 96	*To Construction Cost Card*		$11.5	$0	

Note: Amounts shown are in thousands of dollars.

Attachment 4 to Appendix H

COST CARD

COST CARD TITLE *Construction Cost Card* PROJECT TITLE *School and Services* FIRST NATION *Weareeducated First Nation*	CARD USED TO RECORD ELEMENT - cost X - sub-cost ___

Date	DESCRIPTION	Credit	Debit	Uncommitted Balance	Total Funds Approved
Sep 15/96	*Credit from Master Project Cost Card*	$2,185		$2,185	$2,185
Sep 15/96	*To Renovation Cost Card*		$1,420	$765	
Sep 15/96	*To Water and Sewage Cost Card*		$545	$220	
Sep 15/96	*To Sewage Lagoon Cost Card*		$80	$140	
Sep 15/96	*To Water Storage and Fire Pump Cost Card*		$140	$0	
Feb 5/97	*From Master Project Cost Card*	$15		$15	$2,200
Feb 5/97	*To Sewage Lagcon Cost Card*		$15	$0	

Note. Amounts shown are in thousands of dollars.

Attachment 5 to Appendix H

COST CARD

COST CARD TITLE *Construction Cost Card* PROJECT TITLE *School and Services* FIRST NATION *Weareeducated First Nation*	CARD USED TO RECORD ELEMENT - cost X - sub-cost ___

Date	DESCRIPTION	Credit	Debit	Uncommitted Balance	Total Funds Approved
Sep 15 / 96	*Credit from Master Project Cost Card*	$310		$310	$310
Feb 4 / 97	*To Renovation Cost Card*		$15	$295	

Note: Amounts shown are in thousands of dollars.

Attachment 6 to Appendix H

COST CARD

COST CARD TITLE *Sewage Lagoon Cost Card* PROJECT TITLE *School and Services* FIRST NATION *Weareeducated First Nation*	CARD USED TO RECORD ELEMENT - cost ____ - sub-cost X

Date	DESCRIPTION	Credit	Debit	Uncommitted Balance	Total Funds Approved
Sep 15/96	*From Construction Cost Card*	$80		$80	$80
Feb 5/97	*From Construction Cost Card*	$15		$95	$95

Note: Amounts shown are in thousands of dollars

Appendix I

Outline of an Evaluation Report for a Large Capital Project

PURPOSE

The purpose of the Evaluation Report is to provide:

(a) information on lessons learned, both pro and con, and user satisfaction which will be beneficial in planning, designing, constructing and managing future projects;

(b) an historic reference document containing tombstone data on the scope, technical and financial parameters, physical characteristics, and administration highlights of all phases of the project; and

(c) an assessment of the extent to which the time, cost, and quality objectives of the project were met.

REPORT OUTLINE

Description of the Project

- Provide a detailed description of the project.
- List the principal parts of the project and the scope of work of each part.
- Provide detail on the expected results of the project.

Background

Provide a summary of the project. It should contain:

(a) the title of the project, location, and the contract and project numbers;

(b) the total cost and a financial breakdown (i.e. cost of planning, design, construction, project management, community coordination, change orders, inspection and any other costs);

(c) the geographic and site specific location (include map in appendices). Provide the reason(s) for choosing the site or location;

(d) describe the administrative arrangements made to support the project;

(e) describe the management regime;

(f) names and addresses of the design firm, contractor(s), inspection firm, project manager or project management firm, and the project team;

(g) describe the implementation method;

(h) what steps were taken to ensure the quality (i.e. adherence to the codes, standards, and regulatory requirements) of the project was attained;

(i) consultant(s) involvement;

(j) the schedule (e.g. date of contract award, start date, key milestones, dates of any unusual or unplanned events, completion);

(k) local involvement and community benefits;

(l) training provided (e.g. person years and skills);

(m) location of copy (ies) of as-built drawings;

(n) commissioning details; and

(o) location of operation and maintenance manuals and training needed or provided.

User Satisfaction

Provide the following (identify and explain any deficiencies in the process so steps can be taken to rectify the problem areas and/or avoid the same mistakes in the future):

(a) the reasons for choosing this type of design and how well it met or did not meet the need of the users;

(b) how much community input went into the project and how useful was it;

(c) how did the construction and management methods used benefit or fail to benefit the community;

(d) provide detail on any local content clauses placed in the contract, what local benefits or spin offs resulted, and how improvements in the procedure could be made;

(e) how convenient is the site or location for the users, any problems encountered, and changes which could have been made;

(f) from a maintenance and operation point of view, is the facility suitable and does it match the level of technology available;

(g) does the facility lend itself to multiple uses in the community. Does it provide maximum suitability from an economical point of view; and

(h) how could user satisfaction be improved.

Lessons Learned

Provide the following:

(a) describe any impediments, breakdown in communication, or circumstances which may have caused the project to be delayed, go over budget, or compromise the quality of the work;

(b) describe any particular action taken to meet the time, cost, and quality objectives of the project; and

(c) identify any phase or aspect of the project where different decisions would have brought about improvements to the time, cost, or quality.

Recommendation

- make any additional recommendations not referred to above which can be beneficial in any phase of a similar project.

- summarize key recommendations.